

Science Education Program

Semi-Annual Report



October 1, 1999
through
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LOS ALAMOS NATIONAL LABORATORY

Science Education Program

***Semi-Annual Report
October 1, 1999 – March 31, 2000***

LOS ALAMOS NATIONAL LABORATORY

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Executive Summary

With a new focus, this Semiannual Progress Report summarizes science education programs coordinated by staff from Los Alamos National Laboratory—October 1, 1999, to March 31, 2000. The new focus comes from the March 1, 1999, report of the Commission on Maintaining United States Nuclear Weapons Expertise, generally referred to as the “Chiles Commission Report.” The Chiles Commission Report was written to:

develop a plan for recruiting and retaining within the Department of Energy (DOE) nuclear weapons complex such scientific, engineering, and technical personnel as the Commission determines appropriate, to permit the Department to maintain, over the long term, a safe and reliable nuclear weapons stockpile without engaging in underground nuclear testing.

As referenced in the Chiles Commission Report, the development of “scientific, engineering, and technical personnel” requires education programs that are targeted toward critical skills and that build upon unique Laboratory resources and capabilities. The Los Alamos education program utilizes Laboratory professional expertise to improve the quality of the workforce. This is accomplished by developing and disseminating effective education initiatives and through the recruitment and retention of a quality and diverse group of students.

In the purpose statement of the Chiles Commission report, the phrase “without engaging in underground nuclear testing” means that scientists must understand underlying physics, behavior of materials in extreme conditions and use computer-based computational science techniques to model the reliability of the nuclear weapons stockpile. The Los Alamos Summer School, the Supercomputing Challenge and the Developing Information Systems Careers (DISC) programs deal directly with the discipline of computational science. Many other education programs

in this report use computational science as an integral part of the curricula. Activities in the Physics Summer School, Dynamics Summer School, Modern f-Element class and Radio Chemistry class help students learn about the underlying physics and materials behavior in stockpile stewardship.

Recommendation seven of the Chiles Commission report states the following:

- establish and implement plans on a priority basis for replenishing essential technical workforce needs in critical skills; and
- DOE and its nuclear weapons program contractors should, on a priority basis, develop and implement a detailed and long-term site-specific and complex-wide plan for replenishing the essential scientific, engineering and technical nuclear weapons workforce. Large numbers of workers are reaching retirement and a new generation of workers must be hired and trained in order to preserve essential skills.

This Laboratory Education Program report directly addresses the plan to

replenish the essential scientific, engineering, and technical nuclear weapons workforce by recruiting high-quality candidates and by providing training in essential disciplines. Laboratory scientists and education professionals work together to implement each discipline in the mathematics, science and technology education programs. Students, teachers, college faculty, scientists, industry professionals, and Laboratory employees benefit from the strategically aligned and focused education program.

Section 1 of this report covers scientific disciplines supported by the Department of Energy Office of Defense Programs (DP). These projects are especially linked to Chiles Commission recommendations and critical skills areas of interest to DP and the Laboratory. Section 2 includes information about the

recently established Diversity Working Group. With guidance and direction from DOE/DP Office of University Partnerships and Laboratory management, the diversity group is working to increase the quality and diversity of the employment pool. Section 3 summarized the Postdoctoral Program, which serves a vital function in meeting Chiles Commission recommendations. The final section of the report includes updates about education programs funded by the DOE Office of Advanced Automotive Technologies, NASA, private industry, universities, volunteers and others.

The Science Education Program at Los Alamos is highly valuable to the Laboratory and to DOE. We are very proud of our accomplishments recorded here, and look forward to future work with enthusiasm.

Section 1

Section 1

Mathematics and Science Education Programs

Supported by the
Department of Energy
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Challenge—New Mexico High School Supercomputing

Program Description

The New Mexico High School Supercomputing Challenge is a two-fold educational program. Primarily, it is an academic-year-long program in which teams of one to five high school students conduct computational science projects using high-performance computers. Secondly, during the summer months, it is a computational science and technology-training program for high school teachers.

The program is both an educational experience and a competition that strives to:

- increase students' knowledge of and interest in science-related disciplines;
- expose students and teachers to computational experiences;
- promote careers in science and engineering;
- provide access to high-performance computers; and
- institute electronic networking among schools.

Student Program

Every registered participant receives an access account on a high-performance computer at Los Alamos National Laboratory. This computer is easily accessed via the Internet. If Internet access is not available through school or home, co-sponsor New Mexico Technet provides access to the Internet by providing telephone dial-up accounts.

Each team defines and works on a single computational science project of its own design. Computational science is a discipline in which a scientific problem, be it in biology, physics, geology, medicine, engineering, or any other field, is modeled by one or more mathematical equations. These equations are typically so computationally intensive that a computer, where the work can be accomplished in relatively little time, must solve them. Similarly, the output can be so complex that a computer must also interpret it.

Primary instruction and support is given to the participants during the year as follows:

- three-day Kickoff Conference;
- instruction in project development, teamwork, programming, mathematical modeling, Unix, and other topics;
- school visits to requesting sponsors;
- special assistance to those requesting assistance with computers, networking, programming, or other issues;
- regional workshops in January;
- small workshops held at sponsoring universities and colleges statewide;
- students present the progress on their projects and attend classes in programming, computer graphics, and technical writing;
- project evaluation sessions in February; and
- semiformal presentations held at sponsoring universities and colleges statewide, to a group of scientists who critique and provide feedback to teams about their projects.

Year-Round On-Line Consulting—Technical Support from Challenge Consultants at Los Alamos National Laboratory by Means of Electronic Mail

The sponsoring teachers provide year-round instruction and support. Many have been trained in the art of computational science during the Summer Teacher Training Sessions made available by the Challenge. Additionally, every effort is made to find mentors to help guide the teams through their projects. Very often, these people formally specialize in the area of science or engineering that the student projects reflect.

Various deadlines are posted throughout the year. In general, the project abstract is due in late October, an interim report by mid-January, and the final report by early April.

The academic-year program culminates with an awards ceremony at the Laboratory. Project finalists arrive a day in advance to present their project to a panel of scientists from the national laboratories, industry, and academia. On awards day, prizes and awards are bestowed upon those teams whose projects demonstrate a high level of quality in one manner or another. Additionally, scholarships from universities throughout New Mexico are awarded on an individual basis to qualified Challenge participants. To complete the day, students partake in special tours, talks, and demonstrations around the Laboratory as well as in a student poster contest.

Teacher Program

During the summer, a two-week Summer Teacher Training Session is held at an institution of higher education in New Mexico. Participating teachers are instructed in such topics as computational science, mathematical modeling, programming, Web page design, networking, and others. Participants receive three units of graduate credit for their work.

The Challenge provides instructors, facilities, books, graduate credits, housing, and stipends for food and miscellaneous expenses. Instructors come directly from Los Alamos National Laboratory, and help to further enhance the Laboratory's relations with the New Mexicans.

Teachers who have attended the Summer Teacher Training Session become better able to support their students' endeavors in the Challenge, as well as to develop into healthier computational scientists themselves. Although the days of instruction are intense, teachers always learn a lot and say that they would recommend the sessions to others.

Performance Objectives and Milestones

One goal of the Challenge is to foster creativity in devising computational solutions to scientific problems and to make a positive difference in students' lives, motivating them to prepare for the work force of the future. Many milestones have already occurred this year for the Challenge relating to this goal.

Two new scholarships were added this year, for a total of nine. New Mexico

State University is offering a renewable physics scholarship, \$1,000 per year. New Mexico Highlands University has submitted a \$1,866 per year renewable scholarship. For a complete listing see <http://www.challenge.nm.org/scholarships.shtml>.

This year we introduced three new classes at the Kickoff Conference—Parallel Programming Techniques, Message Passing Interface—MPI Programming, and Java Programming. The Challenge is continuing to provide a technology boost to schools, giving them access to the latest in computing hardware architectures and programming techniques.

A guided project for first year Challenge teams was also created this year. The object of this project is to serve as a tool to educate uninitiated Challenge participants about the nature and processes of the Challenge. Furthermore, it gives the novice participant very basic to advanced programming skills, depending upon how far the project is taken. At <http://www.challenge.nm.org/cryptography/>, the guided project is available on-line.

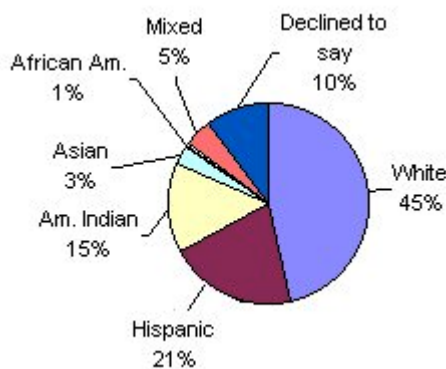
Another milestone reached this year was the development of a set of on-line tutorials. These tutorials will help students learn technical aspects of the Challenge. The *Challenge Technical Guide* is located on-line at <http://www.challenge.nm.org/ctg/> and offers guidance in project development, networking, programming, Web page design, and other topics.

Since 1990, new organizations in New Mexico are continually joining with Los Alamos National Laboratory and New Mexico Technet to sponsor the Challenge. New sponsors include Belew's Office Supplies and Miller Bonded, Inc. A list of our current sponsors can be seen on-line at <http://www.challenge.nm.org/sponsors.shtml>.

Data was collected about the participants. Of the almost 70 teachers in attendance, females and males represented 51% and 49% of the population respectively. It was the first time in over 5 years that female teachers outnumbered males. Over 325 students participated in the 1999-2000 Challenge, 67% males and 33% females. We continue to look for new ways to bolster the female student involvement in the Challenge.

Ethnic representation for students and teachers can be seen in the chart below. We believe that the Challenge has been successful in reaching out to a diverse population.

Ethnicity for 1999-2000



Of the total student and teacher populations, 75% were new students and 40% were new teachers. Additionally, over half of Challenge participants are from small towns and rural areas.



1998 -'99 Finalists from Shiprock.

Most importantly, September 1999 marked the beginning of the tenth year of the Challenge. The Challenge staff has been proud to offer our services to the communities of New Mexico during the past decade. Current information about the Challenge can be viewed on-line at <http://www.challenge.nm.org>.

Relation to Chiles Commission Report

The Chiles Commission Report was written to:

Develop a plan for recruiting and retaining within the Department of Energy (DOE) nuclear weapons complex such scientific, engineering, and technical personnel as the Commission determines appropriate, to permit the Department to maintain, over the long term, a safe and reliable nuclear weapons stockpile without engaging in underground nuclear testing.

The Laboratory is reaching out to the communities of New Mexico. Laboratory scientists are visibly involved in the student and teacher instructional sessions, as well as the awards day talks, tours and demonstrations. As a result, students who are involved in the Challenge view the national laboratories as great places to work, learn, and conduct science. We are, without a doubt, recruiting for the Laboratory scientific talent, who are at a young age.

The Challenge is also directing students towards and instructing in scientific, engineering, and technical disciplines. All of the preceding subjects are natural parts of a computational science project. The phrase “without engaging in underground nuclear testing” directly refers to computational science techniques to model the reliability of the nuclear weapons stockpile. The Challenge is, in fact, training students in these same critical scientific techniques.

Recommendation Seven of the Chiles Commission Report

This recommendation suggests that:

- We establish and implement plans on a priority basis for replenishing essential technical workforce needs in critical skills.
- DOE and its nuclear weapons program contractors should, on a priority basis, develop and implement a detailed and long-term site-specific and complex-wide plan for replenishing the essential scientific, engineering and technical nuclear weapons workforce. Large numbers of workers are reaching retirement and a new generation of

workers must be hired and trained in order to preserve essential skills.

The Challenge is directly aiding in replenishing the essential scientific, engineering, and technical nuclear weapons workforce by stimulating the interest of and training in the discipline of computational science. As a direct example, the winning teams from the last two years have used a cluster of machines named “Theta” to solve their projects. Theta is a cluster of two SGI Origin 2000s, the same architecture as the Accelerated Strategic Computing Initiative, or ASCI, “Blue Mountain” machine.

ASCI is a tri-laboratory and Defense Programs collaboration that will create the leading-edge computations modeling and simulation capabilities that are essential for maintaining the safety, reliability, and performance of the US nuclear stockpile and reducing the nuclear danger. Blue Mountain is a machine that assists in this mission and eliminates the need for underground nuclear testing. This year, two exceptional teams have already requested, and been granted, accounts on the Theta cluster. More will hopefully follow.

Highlights of This Year's Accomplishments/Kickoff Conference

The Challenge was able to obtain Mark Henne from Pixar Animation (a University of New Mexico graduate) to deliver the keynote speech. Additionally, he presented engaging evening discussions about his work on the movie “A Bug’s Life.” This was truly a joy for the students.

Another speaker that came to the conference was the winner in the first New Mexico High School Supercomputing Challenge. It was motivational for the students to see how successful a former Challenge participant has been with his career.



Students in Unix and programming classes at the fall 1999 Kickoff Conference.

Recognition and Awards

The Governor of New Mexico signed a proclamation that designated October as Supercomputing Month, in honor of the Challenge. The plaque has been displayed during Challenge events throughout the year.

David Kratzer of Los Alamos National Laboratory was honored with a Certificate of Appreciation signed by the Governor of New Mexico. The certificate honored his decade of work with the Challenge and the effect it has had on the approximately 5,000 students who have participated in the Challenge.

Congressional Briefing

In early November, Challenge coordinators and participants invited the press and New Mexico's senators and representatives to Bernalillo High School. This event was to celebrate the tenth anniversary of the Challenge and to bring attention to the funding tribulations the Challenge has been facing.

Candace Martinez, a Bernalillo High School computer science teacher and Challenge team sponsor, and her students hosted this Congressional Briefing for Senators Bingaman and Domenici, Representatives Wilson and Udall, and Commissioner Gloria Tristani of the Federal Communications Commission.

Teachers in attendance discussed the importance of the student and teacher training programs. The speed of parallel processing was demonstrated on a high-performance computer at the Laboratory. Students presented their projects and

outlined some of the Challenge elements: what supercomputing is and why it is essential for solving certain kinds of problems; the importance of a mentor for successful projects; and ten-year Challenge statistics.

The guests in attendance overwhelmingly voiced their support for the Challenge and committed themselves to aid in the acquisition of funding to continue the program.

Regional Workshops

A great success this year was the "meet the scientist luncheon" at the regional workshops. Over lunch, local faculty members and scientists discussed the teams' projects with them, offered suggestions, and lent support to their ideas.

Promotion

Several times during the year, Challenge coordinators attended conferences and workshops to promote the Challenge and encourage participation by others. A portion of the Laboratory's booth at Supercomputing '99 in Portland was for a Challenge display.

Other

The Challenge has had a positive impact on students, teachers, schools, and communities throughout New Mexico. As a result, the Laboratory's participation has had a positive effect on participants' perception of the Laboratory. Additionally, the Laboratory has been able to use the Challenge to promote good neighbor practices and has received positive press coverage due to the Challenge.

Plans for the Remainder of the Year

On-line Resources—The Challenge will continue to develop its on-line resources for Challenge participants. More tutorials in programming, computer graphics, and software are expected.

Consulting—The Challenge Staff at Los Alamos National Laboratory will continue to be an active resource for students, teachers, and mentors who have questions or concerns about the Challenge. In particular, at this stage in the academic year, programming questions are routinely submitted to the Challenge consultants at the Laboratory.

Awards Day Ceremony—The academic-year portion of the Challenge will come to a conclusion in April when an estimated 200 participants will come to Los Alamos National Laboratory. The Challenge staff at the Laboratory is actively preparing for Awards Day. In addition to the usual activities listed under the student program description, the students will tour the Laboratory Data Communication Center in the machine room and view the computer(s) that they had been working on.

Ten Year Report—Pending funding, we wish to produce a ten-year report on the Challenge, gathering input from as many past participants as possible. Of the data we have obtained to date, it is interesting to note that one former participant is now with the R&D laboratory at Hewlett Packard that actually designs supercomputer class machines.

Summer Teacher Training

Session—The Challenge staff at the Laboratory is actively pursuing funding in order to continue supporting the teacher-training portion of the Challenge.

As soon as appropriate funds are allocated, we will begin the planning of our summer portion of the Challenge. If funds are not located in a timely manner, we will seek alternatives to keep the training session alive.

The Laboratory and the other Challenge sponsors look forward to their contributions to the future participants and the world in which they will live.



1999 Supercomputing Challenge: Awards Day Finalists at Los Alamos National Laboratory.



Teachers and Staff at the Summer Teacher Training Session at New MexicoTech.

Critical Issues Forum (CIF)

Program Description

Critical Issues Forum 2000 targets high school teachers and students from New Mexico and surrounding communities in a critical thinking process that seeks solutions for current, real world problems. The program incorporates subjects that focus on the nuclear world and Los Alamos National Laboratory's Defense Program mission. Participating students and teachers examine many facets of complex issues related to global concern within the realm of the political, social/cultural, scientific, and economic domains. Work submitted by participating teams is published in the public access *Critical Issues Forum* Web site.

The program draws upon the unique capabilities of Los Alamos National Laboratory by providing program participants an opportunity to interact with Laboratory staff and to participate in the culminating "Student Conference on the Nuclear World" where individual teams present their position to Laboratory personnel.

Dissemination of the program is accomplished through partners who are implementing CIF at their own sites. Lawrence Livermore National Laboratory and the Monterey Institute of International Studies have been partners in the program. In that way, the Laboratory can leverage Defense Program funds and more widely distribute vital information that builds public understanding of the DP mission.

Costs are reduced through the use of the World Wide Web (address: set@lanl.gov). These are costs that would otherwise be incurred through frequent site visits and face-to-face workshops. In addition, the curriculum designed for the program is being used at sites beyond the original scope of the program, demonstrating the potential for future national impact on science, mathematics, and technology education.

Furthermore, because the program objectives are designed to develop critical thinking and problem-solving skills, CIF contributes to the development of a highly skilled workforce, and to the development of public literacy.

Program Objectives

The Critical Issues Forum 2000 is designed to:

- increase content understanding in the science and history of nuclear materials and security safeguards;
- increase public understanding of safeguarding nuclear materials;
- increase teacher and student understanding and use of telecommunications with computers;
- model the use of technology for research purposes;
- demonstrate how to research an in-depth complex critical issue;
- increase content understanding, using a problem-based approach to learning science;
- model the scientific process; and
- promote successful teamwork through cooperative and collaborative learning.

Milestones

| | | |
|-------------------------|---|---|
| September 1999 | Recruiting FY00 cohort (increase participation) | Recruiting activities limited due to funding delay; made contact with previous participants |
| October 1999 | Participating school site visits | Conducted in February |
| September–November 1999 | Development of benchmarks/activities | Completed in November |
| Dec. 1999 | Teacher introductory workshop | Cancelled due to funding delay |
| January 2000 | Program implementation workshop | Accomplished during site visits |
| May 2000 | Laboratory program conference | Scheduled for May 5, 2000 |
| July 2000 | Forum Summer Institute | To be determined |

Highlights

Funding did not become available until mid-February; therefore, complete recruitment was limited. Contact was made through past participants in order to expand recruitment efforts. Seven high schools indicated they wanted to participate and were willing to implement the program. The coordinator provided workshop materials to the students and teachers during scheduled site visits in late February and early March. At present, 86 students (48 male, 38 female) and 25 teachers are involved in the program. Teachers are actively working on their certification at the University of Texas–El Paso (24 of the 25—13 male, 11 female).

Chiles Commission Report

CIF is addressing the *Chiles Commission Report* (see excerpt below), by increasing knowledge and interest in scientific areas. In particular, issues surrounding the nuclear weapons complexes and the nuclear world in general. Many past participants have pursued scientific careers based on their experiences in the CIF Program and their

visits to the Laboratory and the Los Alamos community.

The laboratories and production facilities must increase their presence at national and regional universities, i.e., at science fairs and colloquia and through recruitment visits. Postdoctoral, intern, and continuing education programs should be emphasized as especially important recruitment tools, and special emphasis should be placed on making the nuclear weapons complex an attractive place for women to work, given the increasing fraction of women in the scientific and engineering program at American universities.

Plans for Remainder of the Year

During the remainder of the year, we plan to:

- monitor publication of student work;
- monitor submitted queries;
- organize and implement “Student Conference on the Nuclear World;”
- collect and synthesize evaluative and demographic data; and
- develop and implement a CD ROM for dissemination.

Developing Information Systems Careers (DISC)

Program Description

The Developing Information System Careers (DISC) is a three-year program in partnership with local education and industry alliances designed to meet the critical and growing deficit of trained computer technicians and computer scientists. The DISC program is based on research data from industry that clearly indicates a growing need for career professionals trained in information technologies (IT). Specifically, DISC addresses how to attract and induct people into the field, how to train them for the rapidly growing and advancing market, and how to support and retain them as Laboratory employees, once they have been hired.

DISC Program

The DISC Program acknowledges and supports the need for development of skills in students within five cluster areas, as well as in academic preparation and technical applications. The five clusters, identified in a 1996 report by the Advisory Committee to the National Science Foundation Directorate for Education and Human Resources, are:

- interpersonal skills and teaming;
- proactive approach to work;
- technical competence;
- experience in the workplace; and
- basic skills.

The DISC Program is specifically designed in alignment with the *Chiles Commission Report* to locate employment gaps, both now and in the future, locate young talent to fill these gaps, and work with the participating students to keep them in the employment pipeline.

The DISC Program is designed to improve both the applicant pool and the retention rate of IT personnel at Los Alamos. DISC recruits students state-wide, as early as high school, who have a demonstrated interest and aptitude for

working with computers, and provides rigorous opportunities in pre- and post-secondary training that include early induction into the industry through internships and apprenticeships that lead to employment and retention. Los Alamos National Laboratory will alert teachers, administrators, counselors and other points of contact from the state's vast network of educators to ensure that we offer the most broad number of student opportunities that meet or exceed industry standards in preparing for and performing, in a professional work environment. Furthermore, through the DISC Program, the Laboratory will draw attention to career opportunities in computational science and encourage students to enter the field.

Performance Objectives and Milestones

The goal of the DISC Program is to develop a diverse pool of individuals with IT skills that can be drawn upon, locally and beyond, to assist the Laboratory in building a workforce to meet current and future needs. The four primary objectives are to:

- launch an aggressive recruitment campaign in high schools, colleges,

and universities, particularly in New Mexico, to attract and recruit students into the information technology field, especially targeting those who are interested in technical training and computer science, and to develop and/or nurture their interest in the computer industry;

- establish and support an IT learning environment that allows students to effectively cope with the rigors of academic life (faculty, pedagogy, grading systems, pace, workload, and course level), thereby improving retention, especially for those students who are from at-risk and underrepresented populations;
- provide local two-year and four-year colleges, pre- and postsecondary technical academies, and other training facilities. Provide assistance to develop and improve their programs where IT training is offered through collaborative ventures; and
- develop students' capabilities, specifically to be successful in an industrial environment, through internships and apprenticeships at Los Alamos National Laboratory, and promote a high rate of employment from this group.

Recruitment will focus on graduating high school students headed for two- or four-year colleges throughout northern New Mexico. Students will be selected based on their interest and aptitudes in IT work. The students may work independently or in a team environment depending on the program design requirements. The intent is to have DISC students acquire competence

across the full range of skills and attributes, from computer architecture to programming languages.

Highlights of This Year's Accomplishments

In the final months of 1999, brainstorming and implementation issues identification meetings were held, and start-up strategies and first-year goals were established. Given the short time frame and a voluntary reduction in resources, we elected to focus on:

- establishing and building links to, and recruiting efforts with local two- and four-year colleges;
- minimizing contact with local high schools until FY2001;
- locating and placing a few extraordinary students, from top national universities, with an interest in working and living in the southwest;
- creating strong partnerships with our computing initiative groups;
- getting as many students here for the FY2000 summer in as broad a range of technical areas and divisions as possible; and
- using the lessons learned from student and mentor participants to create a customized FY2001 program interweaving the needs of Los Alamos National Laboratory with the current academic graduate skill base.

Implementation Status

We have made recruiting trips to Northern Arizona University and Eastern New Mexico University and planned trips within the first half of FY2000 to New Mexico State University, New

Mexico Tech, Northern New Mexico Community College, and Santa Fe Community College. We have placed four students in positions ranging from desktop support to artificial intelligence to advanced modeling.

We have met with the Santa Fe Academy and Native American Preparatory School staff, and we will be meeting with Los Alamos High School staff. We are looking for placement slots for students from Española Valley High School and the Native American Preparatory School.

We have located, and are in the process of placing, several interested students from colleges like Massachusetts Institute of Technology, The University of Georgia, Old Dominion University, Baylor, and CalTech. We have made contact and are in a discussion process with the five ASCI Alliance Center level-one contacts. We are on the agenda for their next meeting as a discussion point for whether they wish to be involved in the predoctoral recruiting effort.

We have met with the team leaders and staff of CIC-2 (Desktop Computing), CIC-3 (Computer Research and Applications), CIC-5 (Network Engineering), CIC-12 (Scientific Software Engineering), CIC-13 (Business Information Systems/Enterprise Programming), and CIC-15 (Advanced Database and Information Technologies). In addition, we have met with CIC's Alternative Recruiting Task Force with members from most CIC teams. Finally, we are actively seeking and have ongoing communication with many mathematical and scientific divisions that have regular

state-of-the-art programming and data analysis needs.

We presently have four student participants in the program, with approximately 20 circulating resumes/applications. Two individuals were placed on the Desktop Support Team; one will be on the Integrated Environmental Science Team doing advanced computer modeling; and one will be working on linguistic processing for artificial intelligence. We are finalizing another placement with the Nonproliferation and International Security Team supporting their Genetic (Adaptive) Programming initiative for satellite self-navigation and on-board surveillance decisions.

The implementation of the DISC Program has been rich with learning experiences in all areas of application. There are four primary deterrents impeding our usual efficiency:

- student salary scale;
- inability to consider foreign nationals;
- lack of security clearances; and
- financial tentativeness in the technical divisions.

Deterrents and Courses of Action

The pay scale at the Laboratory for computer science students is 30-50 percent lower than industry. As a result, the DISC Program has lost one outstanding student, and two more are deliberating. Still more are turning away from other programs like ASCENT, which looks specifically and exclusively at the high-end student. At one time, the CIC Division had a 0.5 FTE recruiter who was highly effective at getting top

quality resumes, but retention was poor, due largely in part to disproportionately low salaries and, to a lesser extent, the remoteness of Los Alamos. The student salary scale has recently been approved for change in this regard and this should improve the situation greatly in the future. There is no published definitive change, however, from which we can make offers at this time.

Many of the finest student applications are coming from foreign nationals and some from foreign nationals in sensitive countries. The choice to exclude these students altogether denies the Laboratory, indeed the projects of the Office of Defense Programs, of the best-and-brightest for the sake of security issues, which may not be relevant in some cases. We recently lost (actually never could consider) a young citizen of Russia who is one year from completing his doctorate degree at Old Dominion University, with a 3.95 GPA, majoring in Computer Science, with a dissertation on *Spatio-Temporal Chaos in Near-Integrable, Non-Linear Wave Equations*. The Theoretical Division is recruiting him directly, and we are out of the loop. This does not support our initiative nor help us to establish positive relationships with the technical divisions. The solution here would be to follow the overall Laboratory guidelines; foreign national employment is decided on a case-by-case basis at the Assistant Laboratory Director level—a mechanism that is already in place.

Security clearances have always been an issue at the Laboratory when considering students. Because our projects bring about 1500 students each year and because we have many physical sites which do not require clearances, our

security offices are not prepared to process student hires in a timely manner. In many programs, this is a minor annoyance. It becomes more of an issue for those programs funded by the Office of Defense Programs who would like the students they fund to be assigned to the work they also fund. It becomes an even larger issue when placing students in advanced computing initiatives which largely require clearances to access the facility even if the project itself is unclassified. For FY 2000, this has been a significant challenge due largely to lack of time. In the past year there have been significant improvements in turn-around rate on clearance acquisition and we anticipate that this will get even better in the future. In FY 2001, this will be less of an issue for the DISC Program because we can begin recruiting in the fall. Should clearances be needed in some cases, we will initiate the process immediately. The three-year component of the program will also improve this deterrent, as we can target returning students and initiate the clearance process early, even while the student is still here.

Finally, there is an anecdotally identified financial tentativeness in many of the divisions. The reduction in LDRD funds, and other factors, have created a climate of concern for many divisions, groups, teams, and mentors. Staff seems more conservative than usual about making financial commitments to students when they are uncertain about funding their own people. Even in cases when we can offer a “free student,” as we can occasionally in some programs including DISC, placement is not happening as smoothly as in years past.

This can be attributed to two things:

- even a free student looks expensive (there is overhead and misunderstanding that the student is really free) to others in a perceived funding crisis and
- managers appear to be very concerned about previous

commitments to students and existing staff to the point where they do not act in a timely manner on new student placement within their teams.

These two factors prolong the placement process.

Frontiers in K-12 Science and Mathematics Education Workshop

Program Description

The purpose of the Science and Mathematics Education Workshop is to improve the quality of K-12 science and mathematics education in Navajo schools. The workshop will be held at Diné College (formerly Navajo Community College) in August 2000. The content of the workshop will be driven by the *Navajo Bilingual Life Sciences-Earth Sciences-Space Sciences Education Program*, which has been developed at the Chinle Unified School District under the leadership of Ms. Gloria Grant.

Hands-on and inquiry-based processes will drive the 2-day workshop. Professor Susan Wyckoff and her colleagues at Arizona State University will assist with the programmatic design and implementation. For the past five years, Dr. Wyckoff was Principal Investigator for the \$10 million Arizona Collaborative for Excellence in the Preparation of Teachers (ACEPT) Program funded by the National Science Foundation. The ACEPT Program has demonstrated that we can improve how colleges prepare science and mathematics teachers.

Thirty science and mathematics teachers will be selected to participate in the workshop, including 10 kindergarten-4th grade teachers, 10 5th-8th grade teachers, and 10 teachers working with students from grades 9-12.

Milestones

The following planning meetings were held to determine the scope of the workshop.

- The Window Rock Unified School District
Fort Defiance, Arizona
- The Lawrence Hall of Science
University of California at Berkeley
- The Kirtland Central Unified School District
Kirtland, New Mexico
- The Chinle Unified School District
Chinle, Arizona
- The Department of Physics and Astronomy
Arizona State University
Tempe, Arizona

For more information, please contact Dr. Fred Begay, Community Relations Office, MS A117, Los Alamos National Laboratory, Los Alamos, New Mexico 87545; phone 505-667-8572.

Go Figure! Math Contest

Program Description

On October 9th, 1999, 75 students participated in the Four Corners “Go Figure” math contest which was held at San Juan Community College and at Los Alamos National Laboratory. Other “Go Figure” contests were held simultaneously in central New Mexico and California, coordinated by Sandia National Labs.

The goal of the “Go Figure” competition is to identify young people with latent talent in mathematics who have not demonstrated talent in the usual ways. These are students who may have limited career opportunities because their talents are unrecognized. Mathematics and algebra are the building blocks for all the scientific disciplines. Without the foundation that includes mathematics, a student’s opportunities are limited.

The students who participated in the contest accepted the challenge of a two-and-half hour test on problems that ranged from easy to very difficult. Many students said they enjoyed the contest and found it mentally stimulating and challenging. Many of the students worked on problems out in the hall after they turned in the tests. Students who stayed after the contest and continued to struggle with the problems demonstrated their interest and potential for making progress in solving real-life problems for themselves, their jobs, their communities and their country.

Students were honored at the “Go Figure” banquet held in Farmington on November 20th, 1999. Winners and Honorable Mention “Go Figure” participants who were invited to the banquet at San Juan Community College are:

- Adam London (Best in 12th grade) Farmington
- Peter Valencia (Honorable Mention) Farmington
- Dea Zhan Begaye (Honorable Mention) Farmington

- Ryan Jacobs and Rick Gonzales Begaye (Honorable Mention) Farmington
- Bobby Yares (Honorable Mention) Farmington
- Emanuel Allen (Best in 10th grade) Farmington
- Evan Rens (Honorable Mention) Farmington
- Albert Wang (Best in 9th Grade) White Rock
- Neika King (Best in 8th Grade) Shiprock
- Kyle Yazzie (Honorable Mention) Kirtland
- Todd Carlson (Honorable Mention) Kirtland
- Jonathan Smith (Honorable Mention) Kirtland
- Precious Benally (Honorable Mention) Kirtland

Highlights of This Year's Accomplishments

The keynote speaker, Professor Vernon Willie from San Juan College, talked about the Fibonacci Sequence, Golden Ratio and Golden Rectangle and how they relate and their importance in the Navajo culture. He used the examples of

the nautilus shell and a yucca plant to illustrate the intersection of math and nature.

Vernon Willie said, "I have always found incredible beauty in the sciences, and in particular, the language of science and mathematics. As time has passed, I have encountered some interesting 'intersections' between these fields."

Parents and teachers were invited to say a few words to the group about their sons and daughters. The testimonies were strong with much praise, admiration and love for their children as well as positive comments on the "Go Figure" math contest, the awards banquet, and Los Alamos National Laboratory.

Milestones

"Go Figure" milestones include:

- *Go Figure* Mathematics Contest October 9, 1999;
- *Go Figure* Mathematics Contest Banquet, November 20, 1999;
- *Go Figure* Summer Experience for 1999 "Go Figure" winners; and
- *Go Figure* Mathematics Contest in the fall of 2000.

Go Figure supports the Chiles Commission Report.

The Chiles Commission Report was written "to establish and implement plans on a priority basis for replenishing essential technical workforce needs in critical skills" by:

- identifying young people with talent in mathematics and encouraging them to pursue a math or science career and
- seeking participation in other programs and ultimately to work at the Los Alamos National Laboratory.

As the above milestones indicate, we will bring past winners to Los Alamos National Laboratory this summer to work on a Web site for mathematical activities, tour the Lab and interact with theoretical mathematicians. The next "Go Figure" Four Corners contest will take place in October 2000.

Los Alamos Dynamics Summer School

Program Description

We are developing a summer school program, newly funded in FY00, that is focused on engineering dynamics. This discipline encompasses many aspects of engineering such as shock and vibration, rigid-body flight dynamics, earthquake engineering, vibration isolation, and structural health monitoring. The purpose of this summer school program is to focus on a select group of students in the broad field of engineering dynamics with the hopes that they will be motivated to pursue this area of research in their graduate studies. The summer school program will have two main focus areas:

- The multi-disciplinary nature of research in engineering dynamics will be emphasized by assigning students to teams where a coupled analytical/experimental approach to dynamics problems will be emphasized.
- We will strive to develop the students' written and oral communications skills. To develop these skills, the students will be required to give numerous oral presentations of their work as it progresses throughout the summer, culminating in a paper written for a technical conference.

Mentoring

Each research group will have a mentor (a LANL (Los Alamos National Laboratory), SNL (Sandia National Laboratories) technical staff member or a visiting faculty member) assigned for the duration of the program. The mentor as well as other technical staff members will also prepare daily overview lectures on subjects such as finite element analysis and data acquisition.

Visiting Lecturers

We will bring in prominent guest lecturers in the field of engineering dynamics to give talks to the students about "cutting edge research" in this field. The lecturers will be asked to spend the week with the students to discuss their projects, provide suggestions and encourage additional motivation. Also, as part of their one-

week stay the guest lecturers will be required to propose new student projects for the following summer.

Field Trips

We will develop four field trips. Currently, these field trips include tours of the rocket sled facility at Holoman Airforce Base, The Aging Aircraft Facility, Robotics Facility and Micro-Electromechanical Systems Facility at Sandia National Laboratory, and Intel's Pentium Fabrication Facility.

Unique Aspects of this Program

Some unique aspects of this project are:

- it is an education program focused exclusively on engineering;
- the project will cut across laboratory boundaries as mentors will come from both LANL and SNL;
- students will experience working on multidisciplinary teams; and

- students will participate in "hands-on" experiences conducting experimental activities related to engineering dynamics (experimental activities in engineering dynamics are almost nonexistent at the undergraduate level).

DOE/DP Mission Benefit

We are proposing this summer school concept because engineering dynamics is an integral part of LANL's nuclear weapons stockpile stewardship responsibility. We believe that the proposed program will not only benefit the students through their educational experience, but will also make them aware of career possibilities at DOE DP laboratories after they have completed their graduate studies.

Benefits to LANL

In the last 20 years we have seen a 20% decline in the number of engineering degrees granted. The competition for talented individuals with the background necessary to replace attrition in our current staff, necessitate a pro-active approach of identifying, motivating, and educating students that are to embark on graduate school careers. In this regard, LANL will directly benefit from this educational program as it can serve to pro-actively recruit some of the best young engineering talent in the United States for careers in our weapons engineering programs. To this end, we will make the names and contact information of all students available to the appropriate group leaders at LANL so that these students can be hired as graduate research assistants and continue to

work at LANL throughout their graduate school program.

Performance Objectives and Milestones

The summer school will last eight weeks and will be held at Los Alamos National Laboratory. The program will be designed for 12 upper division, US citizen, undergraduate or first year graduate students. Attempts will be made to identify high quality students from diverse (human and academic) backgrounds. Every attempt will be made to identify students from universities that emphasize undergraduate education as well as research institutes. A variety of academic disciplines will be sought including aerospace engineering, civil engineering, mechanical engineering, electrical engineering, computer science, and mathematics/statistics.

Students will be required to provide written feedback regarding their experiences during the summer school program. The guest lecturers will be required to provide written feedback regarding the projects and overall administration of the program. LANL and DOE education program offices will be provided an annual summary of the summer school and its demographics. We will maintain an "alumni database" to track the careers of the summer school participants over the next few years. The information contained in this database will be used to quantify the success of the summer school program in meeting its intended goals of motivating the students to attend graduate school and pursue engineering careers at DOE DP laboratories.

Milestones

End of November 99: Obtain DOE funds for FY00 summer school and begin to recruit students.

End of January 00: Identify and receive commitments of guest lecture. Obtain approval for field trips. Identify student projects and required equipment/test items.

End of February 00: Identify students for FY00 summer school.

End of March 00: Obtain space allocations for FY00 summer school. Obtain NSF and other matching funds and in-kind support.

To date, all these milestones have been met except for the ones involving additional financial support. NSF has been contacted through electronic mail several times regarding supplemental support, but has yet to return a message. Over 20 industrial and government agencies have also been contacted, but all have declined to provide any support.

The sponsoring agencies for the Shock and Vibration Symposium and the International Modal Analysis Conference have expressed interest in having a session for our students to present their papers. The Shock and Vibration Symposium has a student

paper contest and would like our students to submit their papers to that competition.

A proposal was submitted to LANL's Deputy Laboratory Director for Science and Technology Programs to obtain additional funds to support the guest lecturers. This proposal was successful.

Highlights of this Year's Accomplishments

To date the highlight has been the quality and diversity of the students that have been recruited for the first summer school class. The average GPA of these students is over 3.5. Six of the students are under-represented minorities or women.

Plans for the remainder of the year include successfully completing the remaining milestones.

Milestones

End of May 00

Obtain all necessary hardware and software for FY00 summer school program.

Mid June 00

Begin FY00 summer school program.



Los Alamos Summer School

Program Description

The Los Alamos Summer School, a joint program of the University of New Mexico (UNM) and the Los Alamos National Laboratory, has begun its eleventh year.¹ The school targets upper-level undergraduate students, who will soon be making career choices, and recruits nationally to gain the most able and diverse possible class. We give the students an intense exposure to basic research by concentrating on many fascinating areas of physics, both through lectures by distinguished scientists on the latest developments and through mentored term projects. These areas include such disciplines as astro-, bio-, condensed-matter, plasma, atomic, molecular, optical, and weapons physics. We also have the broader goal of teaching certain basic physics skills not commonly emphasized in the university curriculum, of introducing high-performance supercomputing, and of fostering a personal interaction between research scientists and students. Knowledge of the workings of scientific research, of the frontier discoveries, and of the newest computer techniques will greatly aid students, no matter what their ultimate career choice. For the past eight years, the school has been funded by a National Science Foundation (NSF) Research Experience for Undergraduates (REU) site grant to UNM and by the Science Education Program at the Laboratory through a DOE Defense Programs grant in addition to in-kind support from the Theoretical Directorate and the UNM Center for Graduate Studies and the Department of Physics and Astronomy.

The session divides into two complementary activities involving lectures and a mentored student research project. First, the lectures focus on current "hot topics" in the field of physics, motivated from the speaker's own research projects. The lecturer introduces basic physical concepts from

the perspective of on-going research endeavors. This mode of presentation gives the students an opportunity to participate in new investigations. Second, each student works on a research project for the whole summer term. A mentor from the senior scientific staff of the Laboratory or UNM oversees

¹ Actually, twelve since in FY98. We organized a shorter, complementary program, a Conference Experience for Undergraduates (CEU), in conjunction with a large scientific meeting of the American Physical Society. This program also received joint funding from NSF and DOE through UNM and the Laboratory. A description of the CEU appears in a recent article in the *American Journal of Physics* [67, 685 (1999)].

and guides the student through this endeavor. A variety of projects are available; many center heavily on high-performance supercomputing. The mentors carefully craft each research project to fit the background of the student in order to guarantee the greatest and most effective participation. We have found that this dual track of lectures and research best stimulates in the students an active interest in science and avoids the pitfalls of a program devoted exclusively to one track or the other.

At the behest of students and mentors, who felt the extra time led to more productive projects, we have retained the longer ten-week session for 2000. The students receive three hours of course credit from UNM as Physics 501. This credit has been readily transferred to home institutions and, in many cases, has been substituted for a senior research project. We plan to hold morning lectures and reserve afternoons for research, attempting to strike a balance between these two activities. Classes and computer sessions are held on the campus of UNM at Los Alamos; the UNM computer center has a fast link to the Laboratory network while providing powerful local capabilities. The common class and computer rooms as well as the close proximity within student housing all promote a natural cohesiveness within the class. We further foster this class spirit with tours of Laboratory facilities and of local points of interest and activities. The friendships made during the course of the school form an important, enduring feature of the program as commented upon by almost all students, past and present.

While this basic formula has served the school admirably, we experiment each year with new educational projects and approaches. These experiments function on a small enough scale so as not to endanger general student performance, yet with a broad enough scope to provide reasonable extrapolation. We also include a formal class in technical writing in addition to sessions on the role of science in society. These educational experiments serve each term to reinvigorate and challenge the school anew.

Performance Objective and Milestones

The basic performance objective centers on attracting top upper-level undergraduate students into the area of scientific research through a program involving mentored research projects and lectures by distinguished scientists on current topics. The milestones involve (1) the planning and development of the basic program and the recruiting of students, both occurring in the spring; (2) the running of the program over the summer; and (3) the evaluation of the project in late August.

The recruitment of talented young research scientists to the Laboratory is crucial to secure the future of its basic programs and endeavors.

Highlights of This Year's Accomplishments

The program naturally divides into two phases: (1) recruitment and planning and (2) the actual school session. This year the summer program runs from June 5 through August 11. We have just completed the initial recruitment of

students and have started our search for mentors and lecturers.

Unlike most REU sites, we recruited nationwide with an emphasis on students from schools with little or no graduate research programs. The University of New Mexico handled the recruitment segment, consisting of: (1) an extensive mailing of fliers to all members of several American Physical Society Divisions (about 2000); (2) a color poster sent to most physics, chemistry, and astronomy departments in the United States; and (3) special mailings to minority-designated institutions. We have worked closely with other efforts within the science education area at the Laboratory, including the Historically Black Colleges and Universities program. We have also developed a Web site (<http://www.phys.unm.edu/LASS>) that gives general information and allows direct applications. We have kept the more traditional approaches while expanding our electronic capabilities since we found from a survey of last summer's students that over half learned of the school through fliers and posters. On the electronic front, we have enhanced our Web page and linked it to several major resource sites such as the NSF and GrantNet. In addition, the American Physical Society allowed the use of its general electronic mailers to send announcements to various memberships.

For the year 2000, we received over 100 applications, an increase of almost 15% from 1999. The applicants in general represented a wide range of very talented scholars from institutions around the country. We did notice a slight decline in applications from women and minorities despite the extensive recruiting effort. Whether this finding remains specific to

this program or more global depends on comparison with the experience of other REU sites. The selection committee, consisting of staff from both institutions, met on March 3 and sent offers to 23 students, with a backup list of 8. We expect a final enrollment of about 20 and should have the summer class in place by the middle of April.

We have also begun recruiting mentors and lecturers for the program. As last year, we are employing electronic distribution lists provided by several scientific divisions at the Laboratory as well as personal contact with outstanding mentors from previous years. We hope to achieve last year's result of one mentor for each student and the excellent quality of the projects, as described in a Laboratory publication (LA-UR-99-5455) of the students' reports.

In addition, we have planned two special features. One centers on parallel computing and the other on issues of science and society. The latter will build, in part, on past presentations, such as those by the personnel in the nuclear weapons program, but will expand to cover a wide range of current problems concerning the interaction of science and the world.

Commission on Maintaining United States Nuclear Weapons Expertise

The basic goals of the Los Alamos Summer School closely align with those of recommendation 7 of the Chiles Report to "replenish the essential workforce needs" of the weapons laboratories. Specifically, the program gives high profile and presence through its national recruitment process that

targets both students and teachers at over 2000 universities and colleges, its use of distinguished lecturers from outside academic institutions, and its alumni, who either return to finish their undergraduate degree or continue their education in graduate schools. The school serves as a ten-week intern program in which students become actively involved in a variety of research programs around the Laboratory. We augment the research project with lecturers from a wide variety of Laboratory programs that broaden the scope of the student's knowledge of the local scientific projects. Finally, our

classes have had strong participation by women, consistently at a percentage well above most university physics programs at the same level. We have also employed many women scientists as mentors and lecturers to serve as role models.

Those organizing the program in 2000 include the following: from the Laboratory, Lee Collins (T-4); Norm Magee (T-4); Daniel James (T-4); and Dana Berkeland (P-23) and from UNM, Sally Seidel (PI, NSF-REU Grant) and Howard Bryant.

Nuclear Science Education for the 21st Century: Modern f-Element Chemistry

We detail below our progress to date this fiscal year on four separate projects:

- Spring short-course in Tucson, AZ;
- Summer lecture course at Los Alamos National Laboratory (LANL);
- Sponsoring of research fellows in actinide science during the summer of 2000; and
- Leveraging of institutional funds from the Senior Executive Team at LANL.

On February 28th we presented a four-hour short course entitled "Actinide Chemistry - Environmental Applications" at the Waste Management 2000 Conference in Tucson, AZ. The Conference sponsors included the Waste-Management Education and Research Consortium (WERC). Registrants for the course included employees from the Idaho National Engineering and Environmental Laboratory and Pacific Northwest National Laboratory, and also a Professor of Chemistry from Clemson University who was interested in implementing a course in actinide chemistry. The course was a highly-condensed version of our "Modern f-Element Chemistry" class, although it was aimed at a slightly higher level (since the WM 2000 Conference was attended exclusively by scientists with a background in actinide chemistry).

We have arranged once again to teach the "Modern f-Element Chemistry" course at the University of New Mexico's Los Alamos campus. The course has been added to the summer schedule as course numbers CHEM 325 (undergraduate) and CHEM 537 (graduate). We will continue our collaboration with the broadcasting personnel at the WERC site at New Mexico State University, who will re-broadcast the signal via satellite to downlink sites around the state. We will

distribute an announcement of the summer courses to the students, postdocs and technicians who work at the Laboratory, and we are hopeful that we will at least match last year's registration levels.

We distributed posters to approximately 125 chemistry departments nationwide announcing our intention to fund four Seaborg Institute Research fellows during the summer of 2000. This year we also set up a Web site to receive on-line applications. The deadline for applications was March 1st, and we have just concluded the selection procedure. The selected candidates comprised two junior undergraduates (from Columbia University and Wheaton College), and two second year graduates (from the University of Idaho and Ohio State University). We notified the four successful candidates and they have all accepted our fellowship offer. They will arrive in Los Alamos at the end of May, and will be at the Laboratory for 10-12 weeks. They will take the "Modern f-Element Chemistry" course in addition to performing independent research under the guidance of LANL scientists. At the end of their summer research, they will give oral presentations of their work to groups of staff, postdocs and fellow students.

On February 28th we gave a presentation on actinide educational issues to the

Senior Executive Team (SET) at LANL, which comprises the Laboratory's Director, Deputy Directors and Associate Directors. Our statements regarding the pressing need for a strong

actinide science education program resonated especially strongly with the Deputy Laboratory Director for Science and Technology Programs.

Nuclear Science Education for the 21st Century: Nuclear and Radiochemistry

The progress accomplished to date includes the following:

- four-hour short course was presented at the Waste Management 2000 meeting;
- continued development of the course on Nuclear and Radiochemistry for this summer; and
- selection of research fellows for the nuclear and radiochemistry during the summer.

On February 28th a four-hour short course entitled “Practical Nuclear and Radiochemistry” was presented at the Waste Management 2000 Conference in Tucson, AZ. The Conference sponsors included the Waste-Management Education and Research Consortium (WERC), who were responsible for inviting us to present this course. Registrants for the course included employees from industry and Los Alamos National Laboratory. The course was designed to provide a refresher on introductory nuclear and radiochemistry. Topics included nuclear properties and nuclear instability, types of radioactive decay and interactions with matter, radioactive decay rates, nuclear instrumentation and approaches and examples of treatment of radioactive wastes.

The “Nuclear and Radiochemistry” course has been arranged to be taught at the University of New Mexico—Los Alamos campus for this summer session. The course will be offered for upper level undergraduates and graduate students. The course will be broadcast from the WERC site at New Mexico State University to other sites around the state. We are investigating interest at sites outside of the state. The announcement of the summer course to

Los Alamos National Laboratory personnel will be made shortly. We anticipate considerable interest in the course at the Laboratory from our survey at two two-day workshops offered at the Lab on this topic.

Posters were distributed to approximately 125 chemistry departments nationwide announcing our intention to fund Seaborg Institute Research fellows during the summer of 2000 in nuclear and radiochemistry. This year we also set up a Web site to receive on-line applications. The deadline for applications was March 1st, and we have just concluded the selection procedure; offers have been made to the three students. They will arrive in Los Alamos at the end of May, and will be at the Laboratory for 10-12 weeks. They will take the required orientation and safety training before starting their independent research project. They will also take the “Nuclear and Radiochemistry” course. At the end of their summer research, they will give oral presentations of their work to groups of staff, postdocs and fellow students. We plan to have weekly research seminars with the other members of the fellowship program and their mentors.

Robotics Workshop and Competition

Program Description

The BEAM Robotics Workshop is aimed at teaching youth the basics of **B**iology, **E**lectronics, **A**esthetics and **M**echanics of robotic technology. The program connects with the modern students' love and fascination of robotics. A hands-on environment enables them to create, from their own imagination. The goal is to provide a number of students with the help and tools to build simple robots and to provide them with the capability to continue building new and different robots on their own after leaving the workshop. The workshop has a fairly formal structure of progressing through a series of graded kits. Some of the skills learned are:

- soldering;
- electronics; and
- following instructions.

This knowledge and information can be extended to independent projects.

This year's workshop has added a new dimension with the addition of the Santa Fe Art Institute (SFAI) as a co-sponsor. SFAI will be providing a location site in which to present the workshop, dorm space for the workshop mentors during the seminar, and a lecture hall to hold nightly lectures on robotics and kinetic art, and a speaker from the Santa Fe Institute.

The workshop will have a general two-day seminar, which will consist of approximately 75 to 100 students, split 60/40 between beginning and advanced technologies. We will provide robotic kits for each student and require students to sign up at least a month in advance, with permission from their school. We will bring down the Hrynkiws (from Canada) who, as designers and providers of the robotic kits, will aid in conducting the workshop (they were instrumental in the success of the past two workshops held). In addition we will have four engineers who have participated in the previous workshops and who have been a major source of information for the

student builders. We will be having an advanced subworkshop that will focus on using robots built in previous workshops and enhancing and tuning their capabilities.

On the third day, a Saturday, we will have the facility open to the public for viewing, and the usual series of competitions, in addition to providing time for the students to finish up their robotic creations. On the fourth day (a Sunday) we will continue the new tradition of having a workshop for the younger robotics students (6 to 12 years old), who will learn with a parent.

Milestones

- Beam Robotics Workshop/Competition April 1999
- Beam Robotics Workshop/Competition May 2000 (To be held at the Santa Fe Art Institute)

The Beam Robotics Workshop/Competition supports the

following section of the Chiles
Committee Report, *Establish and
Implement Plans on a Priority Basis for
Replenishing Essential Technical
Workforce Needs in Critical Skills*, by

identifying young people with talent in
electronics and encouraging them to
pursue an electronic, math or science
career.

Summer of Applied Geophysical Experience (SAGE)

Program Description

SAGE is a four-week, intensive geophysics field-based course for upper-level undergraduate students; graduate students; and professionals, including college/university faculty. The program is held in June-July of each year. Students learn to apply geophysical methods to a variety of basic and applied problems, such as characterization of contaminated waste sites and stratigraphic and structural problems associated with the Rio Grande rift. The faculty consists of instructors from Los Alamos and six educational institutions, augmented by personnel from several companies. Techniques employed include seismic refraction, seismic reflection, gravity, magnetics, ground-penetrating radar, electrical resistivity, and various electromagnetic methods, including magnetotellurics. Because of its emphasis on “hands-on” training in field techniques, and on processing and interpretation of data which students themselves gather, SAGE augments and extends the traditional classroom experience in geophysics. The program emphasizes teaching in a research environment. SAGE, the only course of its kind, attracts students nationally and internationally.

Performance Objectives and Milestones

Performance objectives of the SAGE program are as follows:

- Instruct graduate and upper-level undergraduate students in a variety of methods of exploration geophysics and apply these techniques to problems of significant geological interest.
- Involve students in a long-term program of research into the structure/tectonics of the Rio Grande rift and in other applied geological problems, such as hydrology and remediation of contaminated sites (see following figure).
- Bring students and faculty into meaningful contact with Laboratory personnel and programs.

For 17 years, SAGE has had a presence at many regional and national colleges and universities through the students (and even faculty) who have taken SAGE. On some campuses, which have been “repeat users” of the SAGE program for many years, SAGE has had a major (and continuing) presence, and Los Alamos is known for its sponsorship. Numerous students have used SAGE data for their bachelor’s and master’s degree theses. In addition, SAGE faculty and former students have presented talks about technical aspects of SAGE at national meetings and have authored numerous publications in peer-reviewed and professional literature. Thus, many students, their faculty advisors, and other members of the public have been introduced to the Laboratory, to its programs, and to opportunities that are available here over a period of many years. In the last half dozen years, since SAGE has undertaken geophysical surveys of Environmental Restoration sites, students have been particularly associated with Los Alamos

by conducting field work on site and by direct contact with staff members working on the project. Again, in June 2000, SAGE will bring 20-30 highly accomplished undergraduate and graduate students, and additional visitors, to the Laboratory for geophysical surveys related to the Environmental Restoration project. Many former SAGE students have participated in other programs (student interns, GRAs, and postdocs) at several of the national laboratories, and several are now employed at the Laboratories.

Highlights of Accomplishments During Report Period

The main program is held in June and July. Activities completed thus far include data collection, processing, and interpretation on a variety of basic and applied problems; interaction with students, fund-raising efforts, and preparations for the following summer. In November, codirectors W. S. Baldrige and Prof. G. R. Jiracek (San Diego State University) attended the annual meeting of the Society of Exploration Geophysicists (SEG) in Houston, Texas. There they presented a poster for the dual purposes of sharing technical results derived from the SAGE work and of recruiting students for SAGE 2000. In addition, they presented an oral report to the Student Section/Academic Liaison Committee of the SEG. The support and endorsement by the SEG, which represents a large segment of the geophysics private sector, has been of great importance to SAGE. Not only does SAGE receive a direct contribution from the SEG, but also, through contacts with individual members and companies represented at the annual meeting, SAGE receives

tremendous “in-kind” support of state-of-the-art equipment and software.

During the first week of January 2000, SAGE sponsored an annual workshop in seismic, gravity, and magnetic processing for the U.S. undergraduates who participated in SAGE 1999. The workshop was made possible by funding from the National Science Foundation/Research Experiences for Undergraduates program, which provides partial support for undergraduate students and recent graduates to attend SAGE. The purpose of the workshop was to allow the students to pursue a particular geophysical technique in greater depth than they had time for in the main summer program and to provide them with additional time to process and interpret the data they collected the previous summer. It essentially allows students to consolidate the knowledge acquired during the previous summer and to gain greater insight into geophysical problem-solving techniques. Victor Gonzales and Allen Porter, former SAGE students and presently graduate students at San Diego State University, assisted with various tasks related to computer processing and data interpretation. All SAGE faculty were in attendance for the workshop. In January and February, approximately 1000 information and application packages for SAGE 2000 were mailed to geoscience departments and individuals across the U.S., and many completed applications from prospective students were received by the end of March. Despite the large effort that it entails, this mass mailing is the most effective means of reaching many small universities and colleges that do not have dedicated geophysics programs. Every

year, SAGE accepts qualified students desiring careers in geophysics from such departments. During the spring, codirectors Baldrige and Jiracek were in nearly daily contact by e-mail with faculty and prospective students.

In a major development during this report period, the Mobil Oil and Gas Company donated to SAGE, for the cost of photocopying, over 200 miles of industry seismic reflection lines in the Española basin near Santa Fe, New Mexico. These data will be merged with those obtained by SAGE and used for student research and teaching. When properly interpreted, the results will be published and thereby come into the public domain.

In March, the faculty held their semi-annual, two-day workshop at Los Alamos to prepare for SAGE 2000. Agenda items included the location and work plan for the summer's fieldwork, decisions regarding techniques and equipment to be used, planning for industry and academic visitors, and scheduling. Plans for the upcoming SAGE may include geophysical surveys of a potentially contaminated canyon near TA-21 at the Los Alamos National Laboratory, an area currently being investigated by the Environmental Restoration (ER) project. Upon completion of SAGE 2000, results of the fieldwork will be provided to the ER project at no cost. In addition, SAGE will continue to study the subsurface geologic structure and hydrology of rapidly developing areas near Santa Fe. This work is being done in cooperation with the New Mexico Office of the State Engineer and with several independent consulting geologists and other private

citizens concerned about water in the area. These two projects have been very enthusiastically received by the students.

Finally, SAGE 2000 will involve access to public lands administered by the U.S. Bureau of Land Management and the U.S. Forest Service, as well as private ranch land. Codirector Baldrige expended significant effort in obtaining the necessary permits and approvals required by National Environmental Policy Act of 1969 (NEPA) and the Historical Preservation Act prior to the fieldwork. The major activity for the remainder of FY 2000 is to successfully implement the 18th season of SAGE.

The World-Wide-Web page describing the SAGE program, including a description of SAGE 1999 and a list of students, is available at <http://geont1.lanl.gov/SAGE/sage.htm>.

SAGE Faculty

Prof. David Alumbaugh, adjunct,
University of Wisconsin

Dr. W. Scott Baldrige, SAGE
Codirector, Los Alamos National
Laboratory

Prof. Shawn Biehler, University of
California, Riverside

Prof. L. W. Braile, Purdue University

Prof. John Ferguson, University of
Texas, Dallas

Prof. Bernard Gilpin, Golden West
College

Prof. George R. Jiracek, SAGE
Codirector, San Diego State University

SAGE 1999 students conducted several geophysical surveys at Materials Disposal Area (MDA) A at the Los Alamos National Laboratory. MDA-A received mixed waste during and immediately following WWII. Disposal pits and trenches comprising MDA-A were backfilled, and an



engineered cap was placed over the entire area. Shown here, students are using ground-penetrating radar to survey for locations of trenches and pits. Data from this and other SAGE surveys were provided to the ER Project, which is actively investigating the area.

Teacher Opportunities to Promote Science (TOPS)

Program Description

Teacher Opportunities to Promote Science (TOPS) is a three-year teacher enhancement program conducted by Los Alamos National Laboratory for northern New Mexico elementary, middle, and high school science, math, and technology teachers. TOPS began in the summer of 1991. The primary program goal of TOPS is to increase teachers' physical science knowledge and teaching skills while promoting curriculum alignment and communication through computer networking, using the extraordinary resources of a national defense laboratory. Participants in TOPS demonstrate a desire to improve their understanding and teaching skills in science, math, and technology and to integrate those areas into all parts of their curricula and across grade levels. They also agree to stay with their school districts through the duration of the program (two consecutive school years), serving as role models and mentors for their colleagues. Over the course of the program, which spans three fiscal years, TOPS teachers expect to participate in a total of ten meetings:

- one two-day orientation at the Laboratory for General Employee Training and badging;
- three two-week Summer Institutes at the Laboratory; and
- three, academic-year, two-day regional workshops held between each pair of summers (6 workshops in total).

TOPS teachers receive on-going instruction, tuition assistance, classroom materials and equipment, stipends, grants, and interaction with Laboratory scientists and sites. In addition, TOPS teachers have the opportunity to earn up to 24 hours of academic credit from the College of Santa Fe that the New Mexico State Department of Education will accept as fulfillment of the criteria for an Endorsement in Science on their teaching licenses.

Priority is given to applicants from northern New Mexico schools with a high percentage of minority students and/or limited access to businesses, universities, or research institutions with available technical expertise and support. The TOPS program creates teams of teachers across grade levels to promote district-wide systemic change in

science, technology, and math teaching methods and spiral curricula development. Communication is enhanced through computer networking and skill development and optimizes the opportunities for teachers to meet their individual, team, school, district, state, and national education needs.

Performance Objectives

The TOPS Program seeks to enhance the overall quality of science, mathematics, and technology education in New Mexico's school districts by:

- increasing teachers' knowledge of physical science, math, and technology;
- enhancing teachers' skills in teaching science, math, and technology;

- providing hands-on activities and materials to take back to participants' schools;
 - exposing teachers to the application of science, math, and technology to research at national laboratories;
 - providing a mechanism for teachers to encourage students to pursue careers in science, math, engineering, and technology;
 - enabling teachers to train fellow colleagues in their local school districts; and
 - developing a Web-based communications network, to provide a strong educational support network among program participants in their own communities.
- a means for teachers to utilize technology appropriate to the curricula topics;
 - opportunities for enhancement of teachers' use and understanding of science research methods and technology;
 - direct and indirect enhancement of the public understanding of Laboratory issues; and
 - mentors in the form of Laboratory scientists and educators who share their expertise and love of science with the teachers by giving them instruction, providing presentations, answering their questions both in person and on-line, visiting their classrooms, inviting them to their work sites at the Laboratory, and generally doing all they can to assist in the learning and teaching of science, math, and technology.

DOE-DP Mission Benefit

This program leverages the Laboratory's scientific capabilities with our science education program goals by integrating the Laboratory's core competencies to "apply the unique resources of our national laboratories and facilities to improve understanding of science, mathematics, engineering and technology." TOPS supports the DP mission by providing:

- partnerships between numerous Laboratory divisions (STB/EPO, CIC, P, NMT, LANSCE) and education communities (College of Santa Fe, NM State Department of Education, Los Alamos Historical Museum);
- electronic communications technology (Web sites, e-mail, collaborative workspaces) as one method of distributing science educational materials to the public;

Program's Value to the Laboratory

The Laboratory knows that its future success, like the future strength of the nation, depends on a well-educated workforce and a science-literate public. For that reason, the Laboratory and the Department of Energy (DOE) are dedicated to supporting neighboring schools by providing teachers and students throughout northern New Mexico access to the Laboratory's unique resources—its scientists, educators, technicians, and facilities. TOPS is conducted by the Science Education Team to meet its mission to improve the quality of education by implementing effective science, mathematics, engineering, and technology education programs that

address local, regional, and national education and employment needs. An effective way to reach a community is through its children's teachers, and TOPS teachers become better teachers of science who understand and can explain the mission of the Laboratory. Their improved knowledge and skill as science educators make their students more likely to pursue math, science, or technology in their future studies and perhaps, one day, be employed at the Laboratory.

This need for future employees is a focus of the March 1, 1999, report of the Commission on Maintaining United States Nuclear Weapons Expertise, generally referred to as the "Chiles Commission Report." It recommended that DOE, the laboratories, and the production plants establish and implement plans for replenishing their essential personnel in the areas of science, engineering, and technology or face a crisis of talent within the next 15 years. TOPS is an established and proven plan that can meet these needs through the improvement of science education in New Mexico schools.

Milestones

The 1999-2001 cohort of 56 teachers, from 23 different school districts, met in FY99 for the orientation in April and the first of their three Summer Institutes in July. Plans for FY00 included three two-day academic-year regional workshops, the second two-week Summer Institute, and site visits from the TOPS Program Coordinator and Science Education Team Program evaluator.

When DOE-DP funding for TOPS in FY00 was delayed until late January 2000, the regional workshops scheduled for November 1999 and February 2000 had to be cancelled. Those cancellations eliminated a planned 3-hour College of Santa Fe education course. Tentative site visits to the participating schools were no longer necessary and were not scheduled. The next meeting for the TOPS teachers, and the first since June 1999, will be the spring regional workshops in Kirtland, NM, on April 7-8, 2000, and at the Laboratory on April 14-15, 2000. Summer Institute II will take place at the Laboratory on June 19-30, 2000.

Undergraduate Research Semester (URS)

Program Description

The Undergraduate Research Semester (URS) Program at Los Alamos National Laboratory continued the standard of excellence established in 1989 by the Science and Engineering Research Semester (SERS) Program as part of the undergraduate education effort at the three Department of Energy Office of Defense Programs laboratories. The purpose of the research semester was to provide unique and challenging off-campus research opportunities for upper-division university undergraduate science and engineering students. To date, Los Alamos National Laboratory has hosted over 450 undergraduate students in the URS and SERS programs. In FY00, thirteen students completed the final semester of the program.

The URS Program has provided a particularly effective model for bringing high-quality students to the Laboratory to work with scientists on a wide variety of research problems. Science mentors from across the Lab volunteer their time to mentor URS students in the fine art of research. The mentoring relationships that develop during the semester are known, in many cases, to directly influence undergraduates' decisions to attend graduate school and pursue technical careers.

URS participants have access to facilities and state-of-the-art equipment at Los Alamos not ordinarily available on a university campus. The URS Program enhances and facilitates the historic interrelationship between the university community and the Department of Energy Office of Defense Programs laboratories, thereby contributing to the national goal of strengthening the quality of science, mathematics, and engineering research and education. Supplementary educational activities that compliment the research appointment enrich the participants' technical background and perspective for future career decisions. The URS Program encourages

participation by women (39% this year) and underrepresented minorities (32% this year) in science and engineering fields.

Performance Objectives and Milestones

The principal goal of the URS Program is to use the Department of Energy Office of Defense Program's unique national laboratories to develop a diverse workforce of individuals with enhanced problem solving and technical skills. The program also enables the nation to meet current and future scientific and technical workforce needs and contributes to the research in national laboratories.

The principal objectives of the URS Program are to:

- increase student knowledge and skill in science, math, engineering, and technology arenas;
- increase students' understanding of the research process;
- attract students to Defense Programs related areas of research;
- strengthen and focus their field of study and career plans; and

- increase the diversity of students that participate in Defense Programs research.

Highlights of This Year's Accomplishments

The fall 1999 URS Program was completed with thirteen students participating in the closing Poster Session at the Bradbury Science Museum. This was the final session of the URS Program. Of the thirteen students who completed the program, there were three females and ten males. One was Asian, nine were Caucasians, one was Hispanic, and two did not

specify race. The thirteen students provided support to fundamental research in five divisions.

Overall, the URS program was seeing a substantial reduction with respect to incoming student applications due to the loss of the national recruiting infrastructure. The three labs jointly e-mailed promotional materials to 4000 contacts at 2300 universities nationwide to continue the process of stimulating the flow of quality students. When the program lost its funding, we converted the URS tri-lab home page to a general recruiting site for all three laboratories.

Section 2

Diversity Working Group

Diversity Working Group

A New Strategy for Increasing the Quality and Diversity of the Employment Pool

With guidance and direction from DOE/DP, the Science and Technology Base Program Office at Los Alamos National Laboratory has initiated a new strategy for increasing the quality and diversity of the employment pool. The new strategy is grounded in the core competencies and especially the stockpile stewardship mission of the Laboratory.

Background

During FY99, staff in the University Programs Team were responsible for recruiting women and minorities into the following programs: (a) Historically Black Colleges and Universities (HBCU), (b) Underrepresented Minorities and Females, (c) Two-Year College Initiative, and (d) Mentored Collaborative Research. These programs were successful; however, they were small and did not impact the large undergraduate, graduate and DOE/DP science education programs implemented by line organizations in the Laboratory. Due to budget cuts in Congress and an interest to have a greater impact when recruiting minorities and females into all education programs at the Laboratory, a new strategy was initiated for FY00.

FY00 Strategy

The new strategy for increasing the quality and diversity of participation in Laboratory education programs is just beginning to be implemented. The work started with the establishment of a new work group in the Education Program Office called the Diversity Work Group. The work group includes staff previously responsible for education programs for underrepresented students as well as new staff members. The

charge to the Diversity Work Group is to design and implement activities that recruit women and minorities into all education programs at the Laboratory. Basic elements of the strategy are to (a) meet recommendations in the March 1, 1999, report of the Commission on Maintaining United States Nuclear Weapons Expertise, generally referred to as the "Chiles Commission Report," recommendation #7 on page 29, <http://www.dp.doe.gov/public/chilesrpt.htm>; (b) increase the quality of diversified candidates for the employment pool at the Laboratory; (c) enhance the capabilities of underrepresented students and faculty to pursue math and science careers; (d) recruit at majority and minority institutions of higher education, (e) impact the Laboratory employment pipeline to target students for future employment, and (f) increase awareness and knowledge about diversity in Laboratory education programs. In a conversation with Steven P. Younger, Associate Laboratory Director for Nuclear Weapons, the Diversity Work Group has been told that when quality students are identified, funding will be allocated.

The new group is currently developing a work plan for FY00 to include specific activities, persons responsible, milestone and completion dates, and indicators of success with metrics. The metrics

component of the work plan will include an accurate system to collect data about recruiting and implementation. For example: (a) the number of students and faculty contacted, (b) the number of students that follow-up to request additional information, (c) the number of underrepresented students that become part of an education program, (d) a summary of recruiting efforts, and (e) other useful data points.

This report will reflect the Science and Technology Base programs that were funded by the Department of Energy/Defense Programs (DOE/DP) and data from the Teacher Opportunities to Promote Science (TOPS) Program.

The Education Program Office supports the Science and Technology Base of Los Alamos National Laboratory (LANL) by fostering technical excellence through collaborative research with colleges and universities and by carrying out post-secondary science education activities and programs. Special emphasis was placed on supporting the defense programs' technology base, creating a qualified technical pool of diverse candidates for full-time employment, and developing programs that enhance the technical staff, capabilities, and infrastructure of our partner institutions.

Future Program Initiative

As part of implementing the new strategy, the Diversity Working Group explored multiple options to enlist support from the technical divisions to fund student research internships. In order to have an impact on challenges in the *Chiles Commission Report*, the work required staff members to think strategically, explore new options and

consider all available data. For example, the aging workforce will have an impact on scientists, engineers, and technicians at Los Alamos National Laboratory. In addition, the U.S. Bureau of Census states that by 2010, people of color will account for 33% of the nation's population.

In three months, members of the Diversity Working Group have participated in four national conferences and career fairs and have collected over 160 student resumes. This does not include the many e-mails, letters, and telephone calls from students inquiring about possible internships. Because of funding and time constraints, the Diversity Working Group has only been able to place eight students for the summer of 2000. For all eight students, Laboratory technical organizations and other sources budgeted for the student salaries and travel expenses. One student is funded through the National Action Council for Minorities in Engineering's (NACME, Inc.) NASA Scholars Program.

Members of the diversity working group will continue working with business/industry and two-year post-secondary institutions in New Mexico. They have formed a working group (INTEL, Allied Signal, Sandia, and Los Alamos) called the "Technology Advisory Coalition" (TAC). The objectives are to:

- communicate business/industry needs and employment demands;
- identify industry-based competencies for associate degree technology curriculum;
- map out and integrate initiatives and players; and

- provide input to colleges regarding articulations with high schools and universities.

Student Comments

Following are stories from students who have participated in the Mentored Collaborative Research Program and the Historically Black Colleges and Universities (HBCU) program.

Angelique Neuman—"On May 20th, 1996 I was selected for the GRA Program under the Mentored Collaborative Research Program (MCRP). The position was for three months working on erbium oxide research. Near the end of the summer, I asked my supervisor and University Programs (UP) if it would be possible to continue on the project. I was learning a lot and really enjoyed working at Los Alamos. UP was able to come up with 50% of the funding, and my supervisor provided the rest. I was given a one-year extension. During that year I established lots of contacts. I also applied for a job in my group. I was interviewed, but the job was awarded to a person with more experience. I applied for other jobs at the Laboratory and was selected for a job with a different division, where I am currently employed.

Two years later I was promoted to team leader. I don't know how things would have gone if I hadn't been given the chance to work at the Laboratory through the UP program. Most hiring officials at the Laboratory are more likely to take on a student that has funding and, provided things work out, continue bringing them back on group funding, rather than hiring them on the spot.

Thanks for the opportunity to provide input on the UP Program for which I was selected to participate."

Tommy Rockward, M.S.—"This letter comes in regard to student program funding at Los Alamos National Laboratory. Just recently, the Laboratory had several student programs 'zeroed' in terms of funding. For me, the programs have definitely given me an opportunity to advance my scientific background. At Los Alamos, I was able to relate theoretical studies to practical applications. The mentorship provided at the Laboratory enhanced my studies as well as gave me confidence to approach the most difficult problems with ease."

Michelle Lee, M.S.—"My name is Michelle Lee, M.S. I work with the Health Physics Operations Group in the Environmental Safety and Health Division (ESH-1) at Los Alamos as a research staff assistant. In addition, I am a second year Ph.D. student in the Health Education Program at the University of New Mexico; my studies are funded by ESH-1.

During summers of 1991 and 1992, I interned at Los Alamos as an undergraduate research assistant (UGS) through the HBCU Program. I graduated from Grambling State University (HBCU) with a Bachelor of Science in Physics, May 1993. After receiving my BS, I returned to Los Alamos as a Graduate Research Assistant (GRA) under the HBCU Program for 15 months before matriculating to graduate school. During this time, I conducted research, presented the results at an international

conference, and published the data in a scientific journal as first author. Also, I was awarded a DOE applied Health Physics fellowship at Colorado State University. After completing my graduate course work, I returned to Los Alamos the summer of 1996. In May of 1997, my Masters in Radiological Health Sciences was granted.

The HBCU Program at Los Alamos National Laboratory revealed new opportunities and created an avenue that connected me to a community that otherwise would have been inaccessible. Thus far, my achievements can be attributed to the HBCU Program at Los Alamos, as it established a foundation for my educational and career goals.”

Al Hutchinson, M.S.—“I am a technical staff member at Los Alamos National Laboratory currently working with the Business Information Systems Group (CIC-13) as an applications programmer. My opportunity to work and learn from this program was funded by the HBCU program.

For a program to excel and achieve success, it must bring top quality students to Los Alamos That has always been the case despite the fact that the internship package (compensation, housing, etc.) doesn’t measure up to those available in the commercial sector. Also, the Laboratory has benefited from the student presence and participation. The majority of the research that goes on in Los Alamos would not get done if it were not for students. Maybe, for a program to achieve success, it means that students return and hire on after graduation. HBCU students have consistently requested to return for additional internships and have even

tried to hire on but have been sidestepped with budgetary constraints. Unlike the commercial world, two or three years as an intern has no bearing on being employed. I was fortunate enough to find a group leader who was hired at Los Alamos after matriculating through the Undergraduate Student and Graduate Research Assistant Programs and understood their benefit.

Most of the nonminority students I met found out about Los Alamos National Laboratory from professors at their colleges/universities that had direct ties to research teams here at the Laboratory. Since most professors at HBCU schools do not share this direct connection, the loss of the HBCU Program will alienate the Laboratory from hundreds of deserving students.”

Diversity in the Teacher Opportunities to Promote Science (TOPS) Program

Our Teacher Opportunities to Promote Science is a three-year teacher enhancement program conducted by Los Alamos National Laboratory (LANL) for northern New Mexico elementary-, middle-, and high-school science, math, and technology teachers. The primary program goal is to increase teachers’ physical science knowledge and teaching skills, while promoting curriculum alignment and communication through computer networking, using the extraordinary resources of a national defense laboratory. Participants demonstrate a desire to improve their understanding and teaching skills in science, math, and technology and to integrate those areas into all parts of their curriculum and across grade levels; and agree to stay with their school

districts during the duration of the program (two consecutive school years), serving as role models and mentors for their colleagues. TOPS teachers receive on-going instruction, tuition assistance, classroom materials and equipment, stipends, grants, and interaction with Los Alamos scientists and sites. In addition, TOPS teachers may earn up to 24 hours of academic credit from the College of

Santa Fe for an Endorsement in Science on their teaching licenses.

Priority is given to applicants from northern New Mexico schools with a high percentage of minority students and/or limited access to businesses, universities, or research institutions with available technical expertise and support.

TOPS Teacher Participants for 1999-2001
Cohort = 56

| Ethnicity | Number | Percent |
|------------------|---------------|----------------|
| Caucasian | 31 | 55% |
| Hispanic | 16 | 29% |
| Native American | 8 | 14% |
| African American | 1 | 2% |
| Gender | | |
| Female | 45 | 80% |
| Male | 11 | 20% |

County **Number of Participants**

- | | |
|---------------|---|
| 1. Los Alamos | 5 |
| 2. Rio Arriba | 8 |
| 3. Santa Fe | 4 |

Tri-County Total = 17 (1-3 above)

- | | |
|---------------|---|
| 4. San Miguel | 2 |
| 5. Sandoval | 5 |
| 6. Taos | 4 |
| 7. Mora | 3 |

Seven-County Total = 31 (1-7 above)

- | | |
|--------------|----|
| 8. San Juan | 18 |
| 9. Colfax | 3 |
| 10. McKinley | 3 |
| 11. Valencia | 1 |

Total from All Counties = 56 (1-11 above)

Anderson School of Management at UCLA's African-American Leadership Institute

In keeping with the continued development of a program toward providing students with leadership skills, the Diversity Working Group sought participation in the African-American Leadership Institute at UCLA (University of California at Los Angeles).

Graduates usually seek research careers at Los Alamos to be of the world-class science and the rich environment for research. The focus is primarily scientific and often does not allow development of leadership skills. Thus, participation in the African-American Leadership Institute allows the program administrator to share leadership information with young researchers early in their academic and career development. Information obtained from this Institute has assisted and will continue to assist the program administrator with the ability to further instill the ideals of leadership in the program and also to incorporate the information in presentations given at various conferences and campus visits on behalf of the Laboratory.

Leadership Presentations

Members of the Diversity Working Group completed the following presentations:

- National Association of Minority Engineering Program Admin. (NAMEPA), Inc.; March 3-6, 2000, Chicago, IL; *Overview of the*

African-American Leadership Institute at UCLA

- National Society of Black Engineers (NSBE), Inc.; March 21-26, 2000, Charlotte, N.C.; *Creating a Competitive Edge*

Recruitment Activities and Career Fairs

Members of the Diversity Working Group actively recruited at the following career fairs and professional meeting:

- Grambling, Louisiana, October 23, 1999; Grambling State University, Chemistry Department; (Michelle Lee, MS, recruited on behalf of the HBCU Program)
- Hampton/Norfolk, Virginia, October 25-30, 1999; Hampton University, School of Engineering and Technology; Norfolk State University, Department of Chemistry
- Albuquerque, N.M., February 5, 2000; University of New Mexico, National Society of Black Engineers (NSBE), Inc. Regional Chapter Career Fair; (Michelle Lee, MS, and Al Hutchinson, MS, recruited on behalf of the HBCU Program)
- Columbia, Missouri, February 7 and 8, 2000; University of Missouri-Columbia Spring Career Fair; Charlotte, North Carolina, March 24 & 25, 2000; NSBE Career Fair
- Los Alamos National Laboratory Black History Month Acknowledgement; February 3, 2000; Presentation to Dr. Walter

Massey, President, Morehouse College

- National Association of Minority Engineering Program Admin. (NAMEPA), Inc.; March 3-6, 2000, Chicago, IL
- National Society of Black Engineers (NSBE), Inc.; March 21-26, 2000, Charlotte, NC

Published Paper/Article

Pamela Bivens, a member of the Diversity Working Group, published the following:

- *Achieving Workforce Diversity through Strategic Program*

Initiatives: A Model Program to Increase Diversity, National Association of Minority Engineering Program Administrators (NAMEPA), Inc., Conference (1/99), 2/2000.

- *Creating A Competitive Edge*, Black Issues in Higher Education, The Last Word, 11/11/99.

Summary

Through collaborative initiatives, Los Alamos National Laboratory has a tremendous opportunity to recruit, develop, and retain students and leaders of color. This will ultimately create a diverse pool of qualified employee candidates.

Section 3

Section 3

Postdoctoral Program

Postdoctoral Program

The Postdoctoral Program provides a means of advancing knowledge in the areas of basic and applied research and strengthening our national scientific and technical capabilities. Appointees are provided the opportunity to perform research in a scientifically rich R&D (Research and Development) environment.

The Laboratory experience presents appointees the opportunity to derive significant professional accomplishment and advancement of their career goals by publishing and presenting the results of their work and participating in scientific and technical conferences while contributing to the overall research efforts of the Laboratory. Appointees provide valuable stimulus to the research efforts of Laboratory staff and make available current university research endeavors as well as become the communication link between the Laboratory, industry, and universities. The program also serves as a primary resource for selection of regular Laboratory technical staff.

Candidates are nominated and sponsored by a member of the Laboratory's technical staff. Selection is based on Laboratory-wide competition and is determined by the candidate's academic qualifications and research excellence. Postdoctoral fellows are provided the opportunity to pursue independent research of their own choice, while Postdoctoral Research Associates are provided the opportunity to pursue research directly involved with Laboratory programmatic efforts.

Within the postdoctoral fellow category, the program offers prestigious appointments in three fellowship categories: (1) J. Robert Oppenheimer (JRO), (2) Richard P. Feynman (RPF) in Theory and Computing, and (3) Frederick Reines (FR) in Experimental Sciences.

The Oppenheimer Fellowship is named after the first director of the Laboratory and provides the opportunity for recipients to pursue independent research of their own choice.

The Feynman Fellowship, named after the famed theoretical physicist and winner of the 1965 Nobel Prize in Physics, provides the opportunity for recipients to pursue independent research of their own choice in the areas of theory and computing, with emphasis on modeling and simulation. This fellowship opportunity is restricted to candidates that are U.S. citizens.

The Reines Fellowship, named after the former Los Alamos researcher who won the 1995 Nobel Prize in Physics, provides the opportunity for recipients to pursue independent research of their own choice in experimental sciences. The awards go to outstanding experimentalists regardless of their field of study. This fellowship opportunity is restricted to candidates that are U.S. citizens.

A maximum of two fellowships in each category is offered annually. In addition to these prestigious fellowships, there is an average of 50 regular postdoctoral fellows at the Laboratory at any given time and approximately 250 postdoctoral research associates.

Postdoctoral candidates are appointed to an initial two-year term, with an option of a third year if funding is available.

JRO/RPF/FR Fellowship appointments are for three years.

As of March 31, 2000, there were 319 participants in the program. The following is a breakdown of program participants based on gender and ethnicity.

| Ethnicity | Male | Female |
|--------------------------|-------------|---------------|
| Native American | 2 | 0 |
| Asian/Pacific Islander | 41 | 10 |
| African American | 1 | 0 |
| Anglo | 188 | 40 |
| Hispanic | 11 | 2 |
| Ethnicity not identified | 22 | 2 |
| Totals | 265 | 54 |

The following is a breakdown of program participants based on citizenship.

| | |
|------------------------|-----|
| US | 175 |
| Nonsensitive Countries | 100 |
| Sensitive Countries | 44 |
| TOTALS | 319 |

Activities and Initiatives Completed During the First Six Months of FY00

- A tri-lab (Sandia, Livermore and Los Alamos) postdoctoral program meeting was held in Albuquerque, January 2000. This forum provided the opportunity for the participants from the three labs to work together and communicate pertinent information regarding how their programs are run.
- A new postdoctoral category, sponsored by the Intelligence Community was created—two new positions will be funded each year. The processes for administering these appointments are being defined and will be in place in time to consider candidates during the May 2000 quarterly meeting.

Section 4

Section 4

Mathematics and Science Education Programs

Supported by DOE Office of
Advanced Automotive Technologies,
NASA, Private Industry, Universities,
Volunteers and Others

Fuel Cell Education Project

Fuel Cell Tutorial/Project Description

In October 1999, a 36-page, four-color publication *Green Power—Fuel Cells* was published. This activity began in May, 1998. The Fuel Cell Education Project at Los Alamos National Laboratory received funding from the Office of Advanced Automotive Technologies (OAAT) at the Office of Transportation Technology at the U.S. Department of Energy to develop a tutorial for high school and college students on fuel cells. Because OAAT receives numerous requests from students for information on fuel cells, it was determined this tutorial should be designed for the “overachieving” and independently inquisitive student. The tutorial is to be mailed directly to the student at home, so it is important that the brochure be self-contained—including references and resources for easy follow-up. OAAT asked that additional information concerning global climate change and sustainability be included. The 3M Foundation also supported this work through a financial contribution.

Achievements

Developed a “stand alone” publication containing detailed and up-to-date information on developments in fuel cell research and technology. Recent achievements include:

- supplementing the tutorial with information on global climate change and sustainability;
- stimulating independent inquiry by providing appropriate follow-up resources; and
- creating an engaging and visually attractive brochure.

Highlights

High school and college students from around the country have requested copies of the publication. A total of 2000 copies of the printed tutorial have been distributed. A second printing, with minor corrections and revisions, is expected from the printer by the end of April.

Hundreds of copies have been requested by industry. All major automobile

manufacturers are distributing the publication to their staffs involved in the newly formed fuel cell research and development areas. 400 copies were sent to Shell Hydrogen in Amsterdam.

Colleges and universities from around the world are requesting copies.

The publication design received an award of Merit in Technical Publications from the Society for Technical Communication.

Fuel Cell Video Documentary

In May 1999, the Fuel Cell Education Project at the Laboratory was tasked by the Office of Advanced Automotive Technologies at the Department of Energy to develop and produce a video documentary on fuel cells.

Project Description

The goal of the documentary will be to inform a general audience about the benefits of fuel cell technology and show the exciting and challenging

opportunities the technology holds for the future.

The scope of the documentary will be international. Viewers will learn about the work being done in the U.S., Europe and Japan. Demonstration projects—such as the Chicago Transit buses, school projects in Germany, the Reno renewable energy system and fuel cell motor scooter, and the London taxi will be included. Research centers in Japan, Germany, and Canada as well as the U.S. will be part of the production.

The documentary will be produced at the Laboratory. Cambridge Documentary Films (CDF) will serve as the executive producer on the project. The Laboratory will provide state-of-the-art technology, including digital imagery, for the highest quality resolution and animation. CDF has been making films about social issues for more than 20 years. Their numerous achievements include an Academy Award; their films have been presented at film festivals around the world. Through their nonprofit distribution company, their films have reached thousands of students and educators, community leaders and concerned citizens.

The primary focus of the documentary will be fuel cells for transportation. Viewers will be shown that fuel cells are not just laboratory curiosities. While there is much work that needs to be done to optimize the fuel cell system (remember, the gasoline internal combustion engine is nearly 120 years old and still being improved), hydrogen fuel cell vehicles are on the road—*now*.

In addition, the documentary will show that every major automobile

manufacturer in the world is developing fuel cell vehicles. The introduction of fuel cells into the transportation sector will increase fuel efficiency, decrease foreign oil dependency, and become an important strategy/technology to mitigate climate change. As fuel cell vehicles begin to operate on fuels from natural gas or gasoline, greenhouse gas emissions will be reduced by 50%. In the future, the combination of high-efficiency fuel cells and fuels from renewable energy sources would nearly eliminate greenhouse gas emissions. The early transition to lower carbon-based fuels will begin to create cleaner air and a stronger national energy security.

Viewers will also learn about additional applications for fuel cells—including utility and portable power requirements.

The documentary will include the history of fuel cells—with historical drawings and photographs, along with the science of fuel cells—explained by 3-D animation. It is anticipated that OAAT will fund one-half of the production. Additional fund raising activities are underway. Contributions from Motorola and W.L. Gore, Ford Motor Company, the 3M Foundation, and Plug Power have already been received.

Performance Objective

The objective of the project is to successfully complete all aspects of the video production before the end of the year 2000.

Milestones

Interviews and location shooting is well underway. The following highlights the work completed to date.

Sacramento

Dr. Alan Lloyd, Chairman, California
Air Resources Board
Regulatory perspective
California Fuel Cell Partnership

London/Cambridge

Grove Fuel Cell Symposium

Churchill Archives/Francis “Tom”

Bacon’s papers
Don Huberts, President, ShellHydrogen

**W.K.D. Borthwick, Fuel Cell Annex,
European Commission**

Marcus Nurdin, Director, International
Fuel Cell Council

Monrovia, CA

Paul MacCready, President
Aerovironment
Unmanned flight utilizing regenerative
fuel cell technology

Detroit

John Wallace, Director, Alternative Fuel
Program, Ford Motor Company
Harry Pearce, Vice Chair, General
Motors
Ferdinand Panik, VP, Fuel Cell Program,
DaimlerChrysler
Neil Otto, President, Ballard Automotive
Major fuel cell manufacturer

Chicago

Chicago Transit Authority
Fuel Cell Bus Demonstration Program
Chris Galvin, President, Motorola

Direct methanol fuel cells for portable
power

Reno, NV

Desert Research Institute
Solar hydrogen fuel cell refueling
system, fuel cell scooter

Highlights

A detailed time line has been developed along with a complete list of interviewees and locations. Preliminary storyboarding has begun and will be refined as interview footage and transcripts are reviewed. Additional video footage from a variety of sources, including fuel cell manufacturers, automobile manufacturers, NASA, and the National Archives, has been acquired to assist in the editing process.

Filming interviews began in September, and over 75% of the interviews have been completed. Because of significantly reduced travel budgets, it became necessary to hire local crews to provide the technical support for all out-of-town shoots. While this has helped to reduce travel costs, it has led to some production inconsistencies.

Funding within the business sector has been successful, and it is anticipated all contributions will be received within the next four months.

It is expected, with full funding, the premiere of the video will take place before the end of 2000, and efforts for commercial and/or cable distribution will be underway once a rough cut of the video is available.

Los Alamos Space Science Outreach Program (LASSO)

Program Description

The Los Alamos Space Science program (LASSO) focuses on current NASA projects exploring the composition of the Solar System. Projects included in the program are the Advanced Composition Explorer (ACE), the Two Wide-Angle Imaging Neutral-Atom Spectrometers (TWINS), GENESIS, the Mars Instrument Development Program (LIBS), the Lunar Prospector project, and the Center for Space Science and Exploration. The educational component of this project involves teachers and faculty in the development of multidisciplinary/multilevel classroom lessons and activities that focus on the NASA projects.

The LASSO project engages learners in sustained classroom activities that are directly tied to the NASA-LANL space science programs in order to support improved science, math and technology content knowledge and process skills towards the disposition for lifelong learning. It is necessary for science education efforts to support an instructional model based on education research and cognitive theory. Teachers are engaged in developing student activities that encourage critical thinking, a constructivist approach to learning, research, reflection, cycles of inquiry, and iterative assessments over the life of the project.

The LASSO project involves teachers in developing current real-world science lessons and classroom activities through a collaborative, distance learning process. The teacher teams enhance their use of computer technology by developing skills in web page development, concept mapping and Internet research. Participant efforts are consolidated via e-mail and a web-based curriculum. The teachers interact with LANL mentors throughout the program during workshops and summer sessions.

In the program, teachers critically investigate the LASSO projects by examining the science behind the project. LANL mentors from the Laboratory's NIS-1 Division collaborate with the educational program participants providing current content, motivation and support. The participants learn how the scientific data is collected, analyzed and interpreted. They learn

effective instructional methodologies to be incorporated into the lessons and activities for publication on the LASSO educational Web site.

The teachers are expected to collaborate through telecommunications during the research phase and participate in a culminating activity where they will finalize and deliver their web-formatted lessons and activities for the LASSO project.

Program Objectives

LASSO seeks to enhance the overall quality of science, mathematics and technology education in northern New Mexico schools by:

- increasing teachers' and students' knowledge of the science, math and technology involved in space physics;

- enhancing teachers' skills in teaching the content of space physics;
- providing hands-on activities and materials to utilize at participants' schools;
- exposing teachers and students to the application of space physics to research at national laboratories; and
- providing a mechanism for teachers to encourage students to pursue careers in space physics and space science.

Program's Value to the Laboratory

This project leverages the scientific capabilities of Los Alamos National Laboratory with well-established science education program goals by integrating the core competencies to "apply the unique resources of our national

laboratories and facilities to improve understanding of science, mathematics, engineering and technology." LASSO supports the LANL mission in the following ways:

- establishes effective, long-duration partnerships between LANL, northern New Mexico schools at the elementary, middle, and high school, and postsecondary levels;
- establishes a sharing mechanism between Laboratory personnel and the education community through face-to-face workshops and telecommunications links;
- increases Laboratory awareness of educational needs in the community; and
- enhances public understanding of real-world Laboratory issues.

Milestones

| | | |
|---------------------|---|---------------------------|
| March 2000 | Recruiting FY00 cohort | Active recruiting ongoing |
| May 2000 | Introductory workshop | In planning stage |
| July 2000 | Summer Institute | In planning stage |
| August 2000 | Culminating workshop | In planning stage |
| Aug 2000–April 2001 | Program implementation and report follow-up | In planning stage |

Highlights

Recruiting began when funding became available in mid-February. Applications are due in mid-April. The amount of funding and number of space science projects have increased over the last year.

Chiles Commission Report

The program is addressing the Chiles Commission Report (see excerpt below) by increasing knowledge and interest in the science areas, in particular issues surrounding the space sciences. Many past participants have pursued other space science programs and experiences based on their visits to the Laboratory and the Los Alamos community.

“The laboratories and production facilities must increase their presence at national and regional universities, i.e., at science fairs and colloquia and through recruitment visits. Postdoctoral, intern, and continuing education programs should be emphasized as especially important recruitment tools, and special emphasis should be placed on making the nuclear weapons complex an attractive place for women to work, given the increasing fraction of women in the scientific and engineering program at American universities.”

Plans for the Remainder of the Year

During the remainder of the year, plans include the following:

- select and inform participants of LASSO 2000;
- organize and conduct introductory workshop;
- organize and conduct the Summer Institute in collaboration with NIS-1 personnel;
- organize and conduct culminating workshop;
- collect and synthesize evaluative and demographic data; and
- complete final report.

Massachusetts Institute of Technology (MIT) Engineering Internship Program (EIP)

Based on the belief that real-world experience is an important aspect of a sound education, the MIT Engineering Internship Program combines the traditional on-campus academics with off-campus work experiences at the Laboratory. By giving students an opportunity to participate in work experiences early in their careers, they can make more informed choices from among the various on-campus educational offerings, as well as obtain a better understanding of career opportunities available after graduation. Emphasis is placed on ensuring that students in the program are placed in rewarding real-world work assignments that extend the learning experience into areas that are not available at MIT. There is extensive faculty participation and advising in both the on- and off-campus components of the program.

This program provides the opportunity for the participating students to be awarded a B.S./M.S. degree simultaneously upon successful completion of all degree requirements and completion of all three work phases at the Laboratory. Program participants complete a combined B.S./M.S. thesis on a topic related to their work assignment. The thesis topic is normally determined before completion of the second work assignment, and students complete their thesis primarily during the third and final work phase of the program at the Laboratory. All thesis work is completed under the combined

supervision of Laboratory staff members and an MIT faculty member.

As of March 31, 2000, there are eleven students participating in the program, representing nine Laboratory organizations. Of the eleven participants, two will be entering the graduate work phase of the program and completing their Masters thesis project while in residence at the Laboratory.

After completing the annual recruiting trip to MIT in early March, offers are pending to an additional four students for summer 2000, representing three additional Laboratory organizations.

Teacher Conference in Conjunction with Expanding Your Horizons

Program Description - Student Conference

In 1976, the Math/Science Network created Expanding Your Horizons in Science and Mathematics (EYH) student conferences as an intervention strategy designed to nurture girls' interest in mathematics and science courses and to encourage them to expand their career visions to include science- and mathematics-based careers. EYH student conferences have three main goals:

- to increase the interest of young women in math and science by involving them in positive, hands-on experiences in these areas;
- to foster awareness of career opportunities in math- and science-related fields; and
- to provide young women with opportunities to meet and interact with positive female role models who are themselves active in math- and science-related careers.

The New Mexico Network for Women in Science and Engineering and the Los Alamos National Laboratory have provided the annual EYH conferences for northern New Mexico students in grades 7-11 for over 20 years. These conferences take place at the Laboratory and are supported primarily through the donations of money, time, and effort of numerous divisions and employees of the Laboratory and Johnson Controls. On March 6, 2000, over 150 girls from 25 different schools attended two of among 18 different workshops conducted by Laboratory Women in Science. The workshops included such diverse topics as animal behavior, materials characterization, model rockets, Rayleigh-Taylor fluid instability, ecology, Web development, radiation and radioactivity, robotics, genetics and astronomy. The keynote speaker was Sethane Howard, currently with the National Science Foundation, who is the Executive Assistant for two separate international projects—the GEMINI Telescopes Project and the ALMA (Atacama Large Millimeter Array) Project. The title of her talk was

4000 Years of Women in Science, Technology, and Other Altogether Creative Stuff!

EYH Teacher Conference

The 1999 EYH Planning Committee proposed that the Laboratory Education Programs Office provide a special teachers program in conjunction with the student conference. The Education Programs Office agreed and allocated staff and funds for this purpose. A budget of approximately \$2,000 covered the cost of reimbursing schools to hire substitute teachers, provided lunches, and gifted each teacher with the book *Failing at Fairness: How Our Schools Cheat Girls*. The first annual EYH Teacher Conference took place on March 24, 1999, and was a resounding success.

In recognition of the value of this Teacher Conference and to incorporate it as a permanent component of the Expanding Your Horizons Program at the Laboratory, the 2000 EYH Planning Committee allocated part of their budget

for next year's teacher strand. The Education Program Office provided the staff to serve as program coordinator for the EYH 2000 Teacher Conference.

Performance Objectives

The goals of the Expanding Your Horizons Teacher Conference are to provide:

- incentives for teachers to attend by giving them advance program descriptions, registration information, and classroom resource materials;
- materials and speakers that focus on the issues of gender equity and diversity in the classroom;
- first-hand information about several Laboratory science education programs that the teachers can make their students, particularly the girls, aware of and to encourage their participation; and
- hands-on activities and Internet resources that may assist teachers in their classroom science instruction.

Milestones

An invitation to teachers was sent by mail to over 50 northern New Mexico secondary schools in January 2000. The invitation was also posted on the EYH Web site. Registration for the Teacher Conference was made directly through contact with its program coordinator and limited to the first 25 who registered. The agenda featured a variety of

speakers and activities. A summary of each event follows:

- ReefNews is a nonprofit, educational and research organization, officially sanctioned by the Laboratory. It is dedicated to teaching children about the oceans and their shores by providing an educational Web page and a free, biweekly e-mail newsletter. Jonathan Dowell, of the Laboratory's energy and environmental analysis group, is the president of ReefNews, Inc. His talk and slideshow demonstrated that the beauty of our oceans is an excellent tool for getting students and teachers excited about science and their schoolwork. The teachers were given time to visit the Web site for themselves and offered suggestions on how to incorporate its use in their own classrooms.
- The power of supporting students' dreams was the message of the talk by Lisa Gutierrez, head of the Laboratory Diversity Office. She urged the teachers to remember the power they have to encourage kids not only to go into science but also to go for their dreams, whatever they are or how often they may shift. She noted that this is particularly important for girls, especially if they are of cultures where the examples they observe and the messages they receive in their day-to-day lives can limit dreams for females.



Lisa Gutierrez of the Laboratory's Diversity Office counseled the 24 science teachers at the Expanding Your Horizons teachers' workshop to always support the dreams of their students. Photo by LeRoy N. Sanchez.

- A visit to the Bradbury Science Museum was an opportunity to see the displays and learn about the portable StarLab. Teachers were provided information about how to arrange field trips to the Museum for their classes and were made aware that the StarLab can be loaned to their schools (see photo on the following page). Mary Mullen, a statistician with the ecology group, explained how that training could be provided through participation in Laboratory education programs. She gave them a quick look at the various science curricula StarLab can support in addition to astronomy, such as cellular biology and plate tectonics, and demonstrated that the StarLab is very easy to set up and take down.
 - The team program coordinator showed the teachers a Web site that is in development by two northern New Mexico high school teachers and mentors with the High Explosives Science and Technology Group at the Laboratory. Last summer this education program began creating activity modules to use in the classroom to teach and learn about energetic materials—propellants, explosives, and pyrotechnics—and the safety issues associated with their use.
- The 23 participants who attended the Expanding Your Horizons Teacher Conference on March 6, 2000, were from the following northern New Mexico schools:
- Española Middle & High Schools
 - Estancia High School
 - Santa Fe Indian School
 - Los Alamos Middle School
 - Mesa Vista High School
 - New Mexico School for the Deaf
 - Questa High School
 - Taos High and Middle Schools
 - Coronado High School in Jemez Valley
 - Ortiz Middle and Cristo Rey Catholic Schools in Santa Fe
 - Penasco High School
 - Mora Middle School
 - Cuba High School
 - Victory Faith Christian School
 - One Santa Fe Home School



Santa Fe Indian School teacher Chris Trujillo, center, exits the portable StarLab.

The tables below describe the demographics of the 23 EYH Teacher Conference participants.

| Gender | Number | Percent |
|---------------|---------------|----------------|
| Female | 18 | 78% |
| Male | 5 | 22% |

Age

| | | |
|-------------|---|-----|
| 21-30 years | 5 | 22% |
| 31-40 years | 6 | 26% |
| 41-50 years | 9 | 39% |
| 51-60 years | 3 | 13% |

Strongest Ethnic Heritage

| | | |
|------------------|----|-----|
| African-American | 1 | 4% |
| Anglo | 8 | 35% |
| Hispanic | 13 | 57% |
| Native American | 1 | 4% |

Each teacher received a canvas bag provided by EYH that contained:

- the Laboratory education programs catalog;
- the EYH adult packet resource booklet;
- handouts pertaining to science and science teaching;
- detailed information about the Teacher Opportunities to Promote Science Program; and
- a set of “Science Serving Society” posters.

In addition, each teacher was given a copy of the book *How to Encourage Girls in Math and Science*.

Highlights of This Year’s Accomplishments

All the participants completed an evaluation form that critiqued the individual components of the Teacher Conference. By checking off the corresponding boxes, each part of the conference could be rated as dull, just OK, mostly good, or fantastic. A summary of the evaluation ratings clearly indicates the teachers’ overall satisfaction:

- ReefNews—100% mostly good or fantastic
- Diversity Office Speaker—78% fantastic
- StarLab—82% mostly good or fantastic
- Explorations in High Explosive Science—96% mostly good or fantastic
- 43% described the Teacher Conference, as a whole, as exceeding their expectations

The evaluation form also provided an opportunity for the teachers to add any additional comments about the day. Nineteen out of the 23 took the time to do so, and all their statements were very favorable. A few examples follow:

“I hope my students had as good a day as I did!”

“I am very excited that I came. I wish there was enough available space for all the science teachers at my school to be able to come.”

“I have attended several math/science conferences over the years, and this conference was the ultimate! I am looking forward to sharing this information with my students and peers.”

“This is a very good program for students and teachers. The networking and talk with others is wonderful. The presentations are good and the information valuable and useful. I’m so glad I was able to come to this session and will come again if given the opportunity. Please continue this program in the future. It is definitely one of the best—truly a learning experience. Thank you so much!”

“This kind of program should be more frequent—it is very valuable and should be expanded to permit more teachers to have this kind of experience. Please expand this to allow more teachers and students to attend next year.”

“What a great conference!”

“This was my first Teacher Conference—I enjoyed every minute of it.”

“Thanks for this wonderful opportunity to get new ideas and re-charge your teaching career. This was so beneficial—thanks so much!”